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VIRGINIA ACADEMY OF SCIENCE

PROCEEDINGS FOR THE YEAR
1950 - - 1951

Vol. 2, New Series SEPTEMBER, 1951 No. 4

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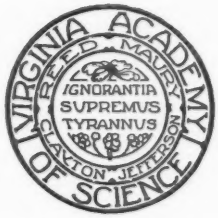
VIRGINIA ACADEMY OF SCIENCE



Proceedings for the Year 1950 - - 1951

MINUTES OF THE TWENTY-NINTH ANNUAL MEETING
MAY 10, 11, 12, 1951

LYNCHBURG, VIRGINIA

LIST OF PRESIDENTS

IVEY F. LEWIS	1923-24
JAMES LEWIS HOWE	1924-25
ROBERT E. LOVING	1925-26
*J. SHELTON HORSLEY	1926-27
*DONALD W. DAVIS	1927-28
WM. MOSELEY BROWN	1928-29
GARNETT RYLAND	1929-30
L. G. HOXTON	1930-31
I. D. WILSON	1931-32
T. McN. SIMPSON, JR.	1932-33
WILLIAM A. KEPNER	1933-34
WILLIAM T. SANGER	1934-35
IDA SITLER	1935-36
H. E. JORDAN	1936-37
D. MAURICE ALLAN	1937-38
EARLE B. NORRIS	1938-39
RUSKIN S. FREER	1939-40
*WORTLEY F. RUDD	1940-41
GEORGE W. JEFFERS	1941-42
MARCELLUS H. STOW	1942-43
*W. CATESBY JONES	1943-44
ROBERT F. SMART	1944-45
H. RUPERT HANMER	1945-46
ARTHUR BEVAN	1946-47
JESSE W. BEAMS	1947-48
SIDNEY S. NEGUS	1948-49
BOYD HARSHBARGER	1949-50
GUY W. HORSLEY	1951-50
PAUL M. PATTERSON	1951-52
LLOYD C. BIRD	1952-53

*Deceased

Virginia Academy of Science

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L. W. JARMAN (1935)
HORTON H. HOBBS, JR.

Ex-Officio Members

JESSE W. BEAMS (1951)
SIDNEY S. NEGUS (1952)
BOYD HARSHBARGER (1953)

LOCAL ARRANGEMENTS—1951 MEETING, MAY 10-12

Lynchburg College, Lynchburg

HOST INSTITUTION: Lynchburg College

Harold H. Garretson, Co-Chairman

Ruskin S. Freer, Co-Chairman

Meeting Rooms ..... John G. Mahan, V. Howard Belcher
Registration ..... Ruth R. Bahous, Mabel A. Sawyer
Housing and Parking ..... Grover W. Everett
Public Relations ..... Mervyn W. Williamson
Projection Equipment ..... M. Weldon Thompson
Exhibits ..... Clyde E. Miller, John G. Mahan
Dinners and Luncheons ..... Pearl G. Griffin, Sallie Scott
Guest Speakers ..... Wilson F. Wetzler
Junior Academy ..... Donald D. Shipley
Registration ..... Lawrence W. Sawyer
Housing ..... Albert H. Shuster, Jr.
Exhibits ..... Laura Jetter Parker
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Fred Helsabeck, *Dean*
Christine K. Wells, *Dean of Students*

ACADEMY COMMITTEES APPOINTED BY PRESIDENT PATTERSON FOR 1951-1952

Officers of Academy will be ex-officio members of all committees

LONG-RANGE PLANNING

Marcellus H. Stow, Chairman
Washington and Lee University

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Justus H. Cline
Byron N. Cooper
Virginius Dabney
Cecil F. DeLaBarre
Cecile B. Finley
Allen T. Gwathmey
H. Rupert Hanmer
George W. Jeffers
Ivey F. Lewis
Sidney S. Negus
C. T. O'Neil
Phillip C. Scherer, Jr.
Robert F. Smart
Lorin A. Thompson
L. E. Ward, Jr.
H. N. Young

PRESIDENT'S ADVISORY COMMITTEE

(*Elected by Sections*)

Officers of All Sections for 1951-52

Agricultural Sciences: E. Mapp Dunton, Chairman; R. C. Carter, Vice-Chairman; T. J. Nugent, Secretary; W. P. Judkins, Section Editor (1955)

Astronomy, Mathematics, and Physics: B. Z. Linfield, Chairman; S. M. Heflin, Secretary; Irving G. Foster, Section Editor (1955)

Bacteriology: William A. Dorsey, Chairman; W. French Skinner, Vice-Chairman; Miss Ada Corpening, Secretary-Treasurer; J. Douglas Reid, Section Editor (1955)

Biology: Jay D. Andrews, Chairman; H. G. M. Jopson, Vice-Chairman; Mrs. H. A. Maurice, Secretary; Ladley Husted, Section Editor (1952)

Chemistry: W. Schuyler Miller, Chairman; Henry Leidheiser, Jr., Secretary; William E. Trout, Jr., Section Editor (1952)

Education: Z. T. Kyle, Chairman; Jack Roger, Secretary; Francis G. Lankford, Jr., Section Editor (1952)

Engineering: B. A. Niemeier, Chairman; V. G. Szebehely, Secretary; Section Editor, Nelson F. Murphy (1953)

Geology: W. Horatio Brown, Chairman; R. S. Edmundson, Vice-Chairman; W. T. Parrott, Secretary; Byron N. Cooper, Section Editor (1953)

Medical Sciences: Daniel T. Watts, Chairman; Ernst Huf, Secretary; William Bickers, Section Editor (1953)

Psychology: A. W. Hurd, Chairman; Stanley B. Williams, Secretary-Treasurer; Frank W. Finger, Executive Committeeman; Austin Grigg, Representative to the Conference of State Psychological Associations; Richard H. Henneman, Section Editor (1954)

Science Teachers: Susie V. Floyd, Chairman; Thomas H. Christie, Chairman-elect; Martha W. Duke, Secretary; L. W. Jarman, Section Editor (1954)

Statistics: Lionel Weiss, Chairman; J. Youden, Vice-Chairman; M. E. Terry, Secretary; W. A. Hendricks, Section Editor (1954)

RESEARCH

Walter S. Flory, Chairman (1954)
Blandy Experimental Farm, Boyce

H. Rupert Hanmer (1952) — Allan T. Gwathmey (1952)
Robert F. Smart (1953) — Frank L. Hereford (1955)
D. Maurice Allen (1956)

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617 W. Grace St., Richmond

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Allen T. Gwathmey	Boyd Harshbarger	L. H. Pownall
	Robert F. Smart	

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Susie V. Floyd	A. G. Macklin	H. Felix Saunders
Thelma C. Heatwole	Vada C. Miller	Oswald Schuette, Jr.
John E. Hocutt	Janie G. Nance	Donald D. Shipley
Mary E. Humphreys	E. W. Pullen	

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College Apts., Williamsburg

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Virginia Polytechnic Institute
Robert P. Carroll, Co-Chairman
Virginia Military Institute

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Vera Baron	Harry G. M. Jopson	James H. Starling
R. D. Cool	Alonzo Myster	Ira A. Updike
Cecile B. Finley	Ashley Robey	Paul A. Walker
	John H. Yoe	

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Clinton W. Baber	H. C. Graybeal	Ashley Robey
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R. C. Carter	Isabel Harris	John E. Simpson
Robert P. Carroll	William M. Hinton	J. W. Watson
H. M. Chase	Mary E. Kapp	R. C. Weaver
W. Donald Clague	Alonzo M. Myster	John H. Yoe

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Washington and Lee University

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Justus H. Cline	A. B. Massey	Foley F. Smith
	I. D. Wilson	

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Justus H. Cline	Elmira C. Maurice	J. J. Shomon
A. R. Cochran	J. L. McHugh	Ross H. Walker
Cecil F. DeLaBarre	Henry S. Mosby	A. L. Wingo
Paul G. Favour, Jr.	E. W. Mundie	

VIRGINIA FLORA

A. B. Massey, Chairman
Virginia Polytechnic Institute

Lena Artz	Walter S. Flory	George C. Mason
Robert P. Carroll	Ruskin Freer	P. M. Patterson

VIRGINIA FAUNA

Jay D. Andrews, Chairman
Virginia Fisheries Laboratory, Yorktown

William T. Allen	Horton H. Hobbs	D. Ralph Hostetter
Paul R. Burch	Richard L. Hoffman	Harry G. M. Jopson
	H. W. Jackson	

VIRGINIA JOURNAL OF SCIENCE

Boyd Harshbarger, Editor-in-Chief
Horton H. Hobbs, Jr., Technical Editor
Virginia Polytechnic Institute

Mary E. Humphreys — Clinton W. Baber

Section Editors
(*Elected by Sections*)

W. P. Judkins ..... Agricultural Sciences
Irving G. Foster ..... Astronomy, Mathematics, and Physics
J. Douglas Reid ..... Bacteriology
Ladley Husted ..... Biology
William E. Trout, Jr. ..... Chemistry
Francis G. Lankford, Jr. ..... Education
Nelson F. Murphy ..... Engineering
Nelson Cooper ..... Geology
William Bickers ..... Medical Sciences
Richard H. Henneman ..... Psychology
L. W. Jarman ..... Science Teachers
Walter Hendricks ..... Statistics

STATE SCIENCE MUSEUM

George W. Jeffers, Chairman
Longwood College, Farmville

EXCHANGE OF FOREIGN STUDENTS

Edgar J. Fisher, Chairman
Sweet Briar College, Sweet Briar

Roy P. Ash — Herta Taussig Freitag — Irving R. Silverman

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Virginia Polytechnic Institute

Robert P. Carroll — D. R. Carpenter
Joe W. Guthridge — Frank C. Vilbrandt

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617 W. Grace St., Richmond

Boyd Harshbarger (1953) — Sidney S. Negus (1952)

RESOLUTIONS

Ladley Husted, Chairman
Miller School of Biology, University of Virginia
Robert T. Brumfield

PLACE OF MEETING FOR 1953

Bruce D. Reynolds, Chairman
University of Virginia

William M. Hinton — William E. Trout

LOCAL ARRANGEMENTS—1952 MEETING, MAY 15-17

Hotel Chamberlin, Old Point Comfort

Host Institutions: College of William and Mary, Williamsburg; College of William and Mary and Virginia Polytechnic Institute, Norfolk

William G. Guy, Chairman

Nelson Marshall, Lewis W. Webb, Jr., Advisory

Meeting Rooms and Projection Equipment ..... Kenneth M. Gordon, George D. Sands, Jr.

Registration ..... Margaret Phillips (Mrs.)

Housing ..... C. S. Sherwood, III

Public Relations ..... Richard B. Brooks

Exhibits ..... Burton R. Wolin

Dinners and Luncheons ..... Eleanor Calkins

Guest Speakers ..... J. T. Baldwin, Jr.

Tours ..... Roy P. Ash, Willard A. Van Engel

Junior Academy ..... Robert S. Bailey, O. F. Shuette

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JEFFERSON MEDAL WINNERS

RECIPIENTS OF THE JEFFERSON GOLD MEDAL[1]

Alfred Chanutin	1936
William B. Porter	1937
H. M. Phillips	1938
G. M. Shear and H. D. Ussery	1939

RECIPIENTS OF THE JEFFERSON PRIZE[2]

L. G. Overholzer and John H. Yoe	1940
Allan T. Gwathmey	1941
R. N. Jefferson	1942
W. H. Hough	1943
Clinton B. Cosby	1944

RECIPIENTS OF J. SHELTON HORSLEY RESEARCH AWARDS

CARL C. SPEIDEL	1927
JOHN H. YOE	1928
J. C. STREET	1929
H. E. JORDAN	
CARL C. SPEIDEL	1930
E. C. STEVENSON	1931
JAMES H. SMITH	1932
S. A. WINGARD	1933
E. P. JOHNSON	1934
MARGARET HESS	1935
ALFRED CHANUTIN	1936
R. G. HENDERSON	1937
S. G. BEDELL	1938
M. J. MURRAY	
F. F. CLEVELAND	1939
WALTON C. GREGORY	1940
CHARLES RAY	1941
NO AWARD	1942
J. B. MEYER	1943
J. H. TAYLOR	1944
NO AWARD	1945
BOYD HARSHBARGER	
D. B. DELURY (separate papers)	1946
NO AWARD	1947
HENRY LEIDHEISER, JR.	1948
WALTER S. FLORY, JR.	1949
ERLING S. HEGRE	1950
DAVID B. DUNCAN	1951

1 The winning papers in this competition were entered against those of the North Carolina, South Carolina, Georgia and Florida Academies of Science. It was discontinued in 1940.

2 The winning authors had the choice of the Jefferson Prize or the Academy Prize during this period. The name of the Academy Prize was changed to the J. Shelton Horsley Award; and the Jefferson Prize discontinued in 1944.

General Program of The Twenty-Ninth Annual Meeting

1951

WEDNESDAY, MAY 9, LYNCHBURG COLLEGE

LYNCHBURG, VIRGINIA

3:00 P. M.—Registration at the College for Junior Academy members, participants in the Science Talent Search, Senior Scientists and Guests, Foyer, Memorial Gymnasium.

THURSDAY, MAY 10, LYNCHBURG COLLEGE

8:00 A. M. to 9:00 A. M.—Setting up Exhibits, Memorial Gymnasium.

8:00 A. M. to 9:00 P. M.—Registration for Junior and Senior Scientists and Guests, Westover Hall.

10:30 A. M.—Participants in Science Exhibit Contest meet with F. S. Scherer in Music Studio A, Memorial Gymnasium.

10:30 A. M.—Participants in Science Exhibit Contest meet with F. S. Andrews and B. N. Cooper, Music Studio B, Memorial Gymnasium.

11:00 A. M. to 3:00 P. M.—Judging of those entering the Science Talent Search, Music Studio A, Memorial Gymnasium and Rooms 1 and 2, Memorial Gymnasium.

12:30 P. M.—Radio Program.

1:00 P. M. to 2:30 P. M.—Judging of Science Exhibit Contests, Memorial Gymnasium.

3:00 P. M.—Meeting of Junior Committee, Room 13, Main Building.

3:00 P. M.—Meeting of the President's Advisory Committee, Room 16, Main Building.

3:30 P. M.—Annual Business Meeting of the Junior Academy of Science, Auditorium, Main Building.
Invited Lecturer: Dr. Harold H. Garretson, Professor of Chemistry, Lynchburg College.

4:00 P. M.—Meeting of the Council of the Senior Academy, Room 16, Main Building.

5:00 P. M.—Meeting of the Editors of THE VIRGINIA JOURNAL OF SCIENCE, Room 15, Main Building.

6:00 P. M.—Junior-Senior Get-Together, Westover Hall.

6:30 P. M.—Junior Academy Dinner, College Dining Hall, Westover Hall.
Presiding—Billy Graham, *President of the Junior Academy*
Greetings—Guy W. Horsley, *President*

Welcome Address—Billy Graham
Presentation of Junior Academy Awards—Dr. B. N. Cooper
Presentation of Virginia Science Talent Search Awards —P. C. Scherer
Address—Dr. Ladley Husted, Head, Miller School of Biology, University of Virginia

8:00 P. M.—Junior Social Hour, Parlors, Westover Hall

8:00 P. M.—Academy Conference and General Meeting, College Auditorium, Main Building
Report of Officers
Report of Committees
Long Range Planning—Marcellus H. Stow, *Chairman*
Research Committee—H. Rupert Hanmer, *Chairman*
Finance and Endowment—Robert F. Smart, *Chairman*
Junior Academy of Science—Byron N. Cooper, *Co-Chairman*
Speakers Bureau—Frank C. Vilbrandt, *Chairman*
Virginia Science Talent Search—P. C. Scherer, *Chairman*
Activities for Collegiate Members—Joe W. Guthridge, *Chairman*
Exchange of Foreign Students—Edgar J. Fisher, *Chairman*
Membership—Foley F. Smith, *Chairman*
James River Project—Marcellus H. Stow, *Chairman*
Resource-Use Education—Alfred L. Wingo, *Chairman*
Virginia Flora—A. B. Massey, *Chairman*
Virginia Fauna—J. D. Andrews, *Chairman*
Virginia Journal of Science—Horton H. Hobbs, Jr., *Technical Editor*
Financial Report of Virginia Journal of Science —Boyd Harshbarger, *Editor-in-Chief*
Science Museum—George W. Jeffers, *Chairman*
Place of Meeting for 1952—William G. Guy, *Chairman*
Local Arrangements—Ruskin S. Freer, *Co-Chairman*
Institute for Scientific Research—Allan T. Gwathmey, *Director*
New Business

FRIDAY, MAY 11, LYNCHBURG COLLEGE

8:00 A. M.—Registration in Westover Hall.
9:00 A. M.—Section Meetings—
Agricultural Sciences, Library

Astronomy, Mathematics and Physics, Room 1, Main Building
Bacteriology, Small Biology Laboratory, Biology Building
Biology, Biology Lecture Room, Biology Building
Chemistry, Auditorium, Main Building
Education, Room 14, Main Building
Engineering, Room 12, Main Building
Geology, Room 25, Main Building
Medical Science, Large Biology Laboratory, Biology Building
Psychology, Room 16, Main Building
Science Teachers, Room 13, Main Building
Statistics, Room 22, Main Building.

12:30 P. M.—Luncheon for members of collegiate chapters and other collegiate members, College Dining Hall, Westover Hall.

12:30 P. M.—Group Luncheons.

1:00 P. M.—Industrial Tour for Junior Academy Members.

2:00 P. M. to 4:00 P. M.—Section Meetings.

4:00 P. M.—Section meetings adjourned. Junior and Senior members of the Academy to be guests at a reception in Westover Hall.

7:00 P. M.—Academy Dinner, Memorial Gymnasium. Tickets must be obtained at the registration desk by Friday noon. Dress, informal.

Presiding—Guy W. Horsley, *President.*
Welcome—Orville W. Wake, *President,* Lynchburg College.
Presentation of J. Shelton Horsley Research Award.
Report of Nominating Committee.
Report of Committee on Resolutions.
Report of Place of Meeting Committee.
Installation of Officers for 1951-1952.

8:30 P. M.—Address—Colonel William S. Stone, Medical Corps, Commandant, Army Medical Service Graduate School, Washington, D. C.
"Army Medical Research in National Defense."

SATURDAY, MAY 12, LYNCHBURG COLLEGE

9:00 A. M.—Section Meetings.

10:00 A. M.—Academy Council Meeting, Faculty Lounge, Westover Hall.

2:00 P. M.—Field Trips (see bulletin boards for further information).

Minutes of the Meeting of the Council, May 10

The meeting of the Council of the Senior Academy was held at 4 P. M. June 16, Main Building, Lynchburg College, Lynchburg. Present were: President Guy W. Horsley, presiding: Sidney Negus, Allan Gwathmey, Edward Harlow, Ladley Husted, Paul Patterson, L. W. Jarman, Horton H. Hobbs, Marcellus Stow, and Foley F. Smith.

The first order of business was discussion of the audit of THE VIRGINIA JOURNAL OF SCIENCE, and the report was made by Horton H. Hobbs, Jr., Technical Editor, in the absence of the Editor-in-Chief, Boyd Harshbarger. It was noted with deep regret that Mr. Harshbarger could not attend the annual meeting due to illness. It was properly moved and seconded that the Academy reimburse THE VIRGINIA JOURNAL OF SCIENCE $2.00 for each Life member and Patron of the Academy, as such members receive the Journal, but do not pay any annual dues to the Academy. Honorary members, who are elected to membership by the Council, are to receive the Journal free. Miss Mary E. Humphreys, Mary Baldwin College, was appointed Assistant Technical Editor of the Journal. Mr. Stow discussed the problem of Student membership, pointing out that the student member pays $1.00 per year for membership and receives nothing in return other than the program of the annual meeting. Since those who wish to receive the Journal would have to pay a minimum of $3.00 for a regular membership, there is no advantage or inducement for a student member to belong to the Academy as such. This problem was tabled for further consideration by the Council.

Mr. Jarman suggested several changes in the set-up of the Science Talent Search and Junior Academy to facilitate dissemination of information, and more efficient handling of the many problems in conducting the Talent Search. The question of financial assistance to the Talent Search winners was discussed, and the Council was asked to consider some means by which this important work could be continued.

It was properly moved, seconded, and passed, that Section 4 of the By-laws be changed to read as follows: "In the case of this exception, the upper limit of the representative's expenses to be paid by the Academy shall be round-trip railroad fare, plus a maximum of $15.00 per day expenses." This is to change the present part of this section, concerning "Representation at Meetings" which reads as follows," in the case of this exception, the upper limit of the representative's expenses to be paid by the Academy, shall not exceed one hundred dollars ($100.00) annually."

Mr. Harlow, whose term expires this year, expressed his appreciation of the privilege of being a member of the Council. There being no further business, the meeting adjourned at 5:45 P. M.

FOLEY F. SMITH, *Secretary.*

Minutes of the Academy Conference

The Academy Conference convened in the auditorium of the Main Building of Lynchburg College, Lynchburg, 8:30 P. M. May 10, 1951. Approximately sixty members of the Academy were present.

President Guy W. Horsley presided and expressed the official thanks of the Academy to the Committee on Local Arrangements and to Lynchburg College as the Host Institution.

The Committee reports which follow were all formally accepted to be included in the Annual Proceedings.

REPORT OF THE SECRETARY-TREASURER

The Academy has suffered loss of two former Presidents and Charter members of the Academy since its last meeting in Roanoke, in May 1950.

The January issue of THE VIRGINIA JOURNAL OF SCIENCE was dedicated to Donald Watson Davis, Chairman of the Department of Biology of the College of William and Mary, who died on June 30, 1950.

The April issue of the Journal was dedicated to Dean Worthley Fuller Rudd, Dean-Emeritus of the School of Pharmacy, Medical College of Virginia, who died July 26, 1950.

The high esteem in which these charter members of the Academy were held is shown by the dedication of these two issues of the Journal.

The Council met in the Alderman Library, University of Virginia, Charlottesville, on November 12, 1950. The Minutes of this meeting is contained on pages 63 through 67 of the January issue of THE VIRGINIA JOURNAL OF SCIENCE.

The Research Committee and the Finance and Endowment Committee have met and their report follows with the reports of the other committees.

Dr. E. C. L. Miller, Secretary-Emeritus of the Academy, represented the Academy at the installation of Dr. Everett, as President of Hollins College 16 April 1951. The Academy was also represented at the Cleveland AAAS meeting by Dr. Boyd Harshbarger, who served as the Academy Conference President, and by President-Elect Paul Patterson, and on the AAAS Council, by the Academy Secretary.

Publications of the Academy, including several issues of THE VIRGINIA JOURNAL OF SCIENCE, and several copies of the *Academy Monograph* - "The James River Basin - Past, Present and Future" was a part of a special exhibit of the State Academy Publications at the Cleveland meeting. Both publications received many favorable comments, particularly the Monograph, which was also exhibited in the Press room and received many favorable comments from the Science Writers represented.

The financial condition of the Academy is contained in the Auditor's report, which will be discussed in detail in the report of the Finance

and Endowment Committee, and will be printed in full in the Proceedings of the Academy, i.e., the September 1951 issue of THE VIRGINIA JOURNAL OF SCIENCE.

FOLEY F. SMITH, *Secretary-Treasurer*

Richmond, Virginia
May 1, 1951

The Officers and Council Members
Virginia Academy of Science
Richmond, Virginia

Gentlemen:

I have prepared from the Secretary-Treasurer's books of account and record of

VIRGINIA ACADEMY OF SCIENCE, RICHMOND, VIRGINIA

the statements listed in foregoing index covering the activities for the year ended March 31, 1951.

The Statement of Cash Receipts and Disbursements, Exhibit, "B," reflects the General Fund cash transactions; and the Statement of Cash Receipts and Disbursements, Exhibit "C," reflects the Research Fund cash transactions for the year ended March 31, 1951. The cash in bank was verified by direct correspondence with the depository bank and the balance reported reconciled with the amount shown on the Consolidated Fund Balance Sheet, Exhibit "A."

The cash receipts of record were traced in total to the record of their deposit in bank, and all recorded disbursements were evidenced by properly signed cancelled checks with the exception of those checks outstanding at the balance sheet date and checks bearing numbers 1319 to 1348, inclusive, which have been misplaced.

The figures shown on the Consolidated Fund Balance Sheet, Exhibit "A," and statements of Cash Receipts and Disbursements, Exhibits "D" and "E," relating to Trust Fund accounts were taken from the March 31, 1951 report of the Trust Agent, First and Merchants National Bank of Richmond and, with the exception of cash, were not verified in any manner.

Respectfully submitted,

J. WADDELL RISON, Certified Public Accountant

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA
CONSOLIDATED FUND BALANCE SHEET
MARCH 31, 1951
(Prepared from Records without Audit or Verification)

EXHIBIT "A"

ASSETS

GENERAL FUND:			
Cash in Bank (Exhibit "B")		$ 3,412.21	
Accounts Receivable		50.00	
Total General Fund			$ 3,462.21
RESEARCH FUND:			
Cash in Bank (Exhibit "C")		$ 1,151.85	
Total Research Fund			1,151.85
TRUST FUND-PRINCIPAL ACCOUNT (See Footnote):			
Cash Due from Depositary		$ 369.73	
Investments (At Cost):			
United States Savings Bonds Series F. & G. (Market Value $7,528.45)	$ 7,837.00		
Stock Securities (Market Value $4,995.63)	4,901.41		
5% Real Estate Note (Secured by First Deed of Trust)	2,500.00	15,238.41	
Total Trust Fund Principal Account			15,608.14
TRUST FUND - PRINCIPAL INCOME ACCOUNT (See Footnote):			
Cash - Due from Depositary (Exhibit "D")		$ 131.88	
Total Trust Fund Principal Income Account			131.88
TRUST FUND ACCUMULATED INCOME ACCOUNT (See Footnote):			
Cash Due from Depositary (Exhibit "E")		$ -	
Investments (At Cost):			
Preferred Stocks (Market Value $1,650.50)		1,790.85	
Total Trust Fund Accumulated Income Account			$ 1,790.85
			$ 22,144.93

NOTE:
Trust Fund Account figures were taken from Trust Agent's report, First and Merchants National Bank of Richmond, and exclusive of cash, were not verified in any manner.

EXHIBIT "A" (Continued)

LIABILITIES AND FUND SURPLUS

GENERAL FUND:			
Advance Payments on Dues		$ 9.00	
Due to THE VIRGINIA JOURNAL OF SCIENCE		258.00	
Fund Balance		3,195.21	
Total General Fund			$ 3,462.21
RESEARCH FUND:			
Fund Balance		$ 1,151.85	
Total Research Fund			$ 1,151.85
TRUST FUND PRINCIPAL ACCOUNT:			
Fund Surplus:			
Balance, April 1, 1950		$ 15,820.80	
Deduct:			
Loss on Sale of Stock	$ 209.01		
Loss on Sale of Stock Right	3.65	212.66	
Balance, March 31, 1951		$ 15,608.14	
Total Trust Fund Principal Account			$ 15,608.14
TRUST FUND - PRINCIPAL INCOME ACCOUNT:			
Fund Balance:			
Balance April 1, 1950		$ 156.13	
Deduct - Excess of Income Distribution and Expenses over Income (See Exhibit "D"		24.25	
Balance, March 31, 1951		$ 131.88	
Total Trust Fund Principal Income Account			131.88
TRUST FUND ACCUMULATED INCOME ACCOUNT:			
Fund Balance:			
Balance, April 1, 1950		$ 1,790.85	
Add - Dividend Income on Stock		65.52	
		$ 1 856.37	
Deduct - Income distribution and cash transfer (See Exhibit "E")		65.52	
Balance - March 31, 1951		$ 1,790.85	
Total Trust Fund Accumulated Income Account			$ 1,790.85
			$ 22,144.93

VIRGINIA ACADEMY OF SCIENCE
RICHMOND, VIRGINIA

GENERAL FUND
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDED MARCH 31, 1951

EXHIBIT "B"

BALANCE ON DEPOSIT - APRIL 1, 1950:			$ 2,995.52
RECEIPTS:			
Revenue:			
Dues:			
Regular Members	$ 2,050.00		
Collegiate Members	75.00		
Contributing Members	308.00		
Sustaining Members	280.00		
Life Membership (Paid on account)	50.00	$ 2,763.00	
Excess of Income from Annual Meeting over Expenses:			
Proceeds from Meeting Activities	$ 889.00		
Expenses Incurred and paid	872.50	16.50	
Miscellaneous Revenue		4.00	
Non-Revenue:			
Pledges collected - THE VIRGINIA JOURNAL OF SCIENCE		559.50	
Advance payment of Dues		9.00	
Total Receipts			3,352.00
			$ 6,347.52
DISBURSEMENTS:			
A.A.A.S.		$ 100.00	
Honorarium		300.00	
James River Project		210.82	
Junior Academy of Science		125.00	
Miscellaneous and General Expenses		179.26	
Postage and Express		105.21	
Science Talent Search		23.17	
Stationery Supplies and Stenographic Services		84.35	
THE VIRGINIA JOURNAL OF SCIENCE - Schedule "1"		1,805.50	
Transfer of Advance dues payment current revenues above		2.00	
Total Disbursements			2,935.31
BALANCE ON DEPOSIT - MARCH 31, 1951 (Exhibit "A")			$ 3,412.21

Consisting of:		
Cash on Deposit - First and Merchants National Bank of Richmond - Checking Account:		
General Fund	$ 3,448.35	
James River Project	- 36.14	
Total		$ 3,412.21

RESEARCH FUND

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1951

EXHIBIT "C"

BALANCE ON DEPOSIT - APRIL 1, 1950		$ 658.61
RECEIPTS:		
Revenues:		
Income From Trust Investments	$ 645.99	
Gifts, Grants and Bequests	200.00	
Total Receipts		845.99
		$ 1,504.60
DISBURSEMENTS:		
Grants-In-Aid Awards	$ 350.00	
Miscellaneous and General Expenses	2.75	
Total Disbursements		352.75
BALANCE ON DEPOSIT - MARCH 31, 1951 (Exhibit "A")		$ 1,151.85
Consisting of:		
Cash on Deposit First and Merchants National Bank of Richmond - Checking Account		$ 1,151.85

TRUST FUND INVESTMENT PRINCIPAL - INCOME CASH ACCOUNT

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

FOR THE YEAR ENDED MARCH 31, 1951

BALANCE - APRIL 1, 1950:		$ 156.13
Receipts:		
Revenue:		
Dividends on Stocks Held	$ 276.75	
Interest on Government Bonds	195.00	
Interest on Real Estate First Deed of Trust Notes	149.47	
Non-Revenue:		
Transfer of Income from Accumulated Income Account	16.38	
Total Receipts		637.60
		$ 793.73
DISBURSEMENTS:		
Remittances to Virginia Academy of Science Research Fund	$ 596.85	
Appraisal Fees on Loan Property	15.00	
Trust Agent's Commission	50.00	
Total Disbursements		661.85
BALANCE - MARCH 31, 1951 (Exhibit "A")		$ 131.88

TRUST FUND INVESTMENT - ACCUMULATED INCOME CASH ACCOUNT

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDED MARCH 31, 1951

EXHIBIT "E"

RECEIPTS:		
Income - Dividends on Stocks Held		$ 65.52
DISBURSEMENTS:		
Remittances to Virginia Academy of Science Research Account	$ 49.14	
Transfer to Principal Income Cash Account	16.38	
Total Disbursements		65.52
BALANCE - MARCH 31, 1951		None

ANALYSIS OF COLLECTIONS FOR AND REMITTANCES TO THE VIRGINIA JOURNAL OF SCIENCE

FOR THE TWELVE MONTHS ENDED MARCH 31, 1951

SCHEDULE "1"

COLLECTIONS:

	Paid Up Membership	*Pledges Received*	*Together*
Total Pledges		$ 559.50	$ 559.50
752 Paid Memberships for the year 1950 - 1951 at $2.00	$ 1504.00		1,504.00
Total Collections	$ 1,504.00	$ 559.50	$ 2,063.50
REMITTANCES:			
June 2, 1950		$ 109.00	$ 109.00
February 20, 1951	$ 1,282.00	414.50	1,696.50
Total Remittances	$ 1,282.00	$ 523.50	$ 1,805.50
BALANCE DUE - MARCH 31, 1951	$ 222.00	$ 36.00	$ 258.00

REPORT OF THE LONG RANGE PLANNING COMMITTEE

A joint meeting of the Long Range Planning Committee and the James River Project Committee was held on May 10 at 12:15 at Lynchburg College. Fifteen members were present.

The Chairman presented a statement concerning the status of the sales of the James River Monograph. There was considerable discussion of this matter and several helpful suggestions for increasing sales were presented. Among them were: Have a Richmond Department Store promote its sale, Have the Williamsburg Restoration organization participate in its distribution, Ask individual members of the Academy, distributed throughout the State, to sell a specific number of copies.

It was emphasized particularly that the objective in promoting the sale of the monograph was not primarily to obtain money, but to get the book into the hands of those people who should be most interested and concerned with its contents.

The group recommended that the James River Project Committee give consideration to publication of a book on the James River Basin that would sell for about one dollar and that would be written for High School student use.

The joint committees recommended that the Virginia Academy of Science offer its research personnel and facilities to the Advisory Council on the Virginia Economy for such cooperation in obtaining scientific information as the Council might need and request.

Dr. Philip C. Scherer, Chairman of the Virginia Science Talent Search Committee, presented a statement concerning establishment of the Science Club Foundation of Virginia. The document was discussed but no action taken.

Various other items concerning the future work of the two committees were considered.

The meeting adjourned at 3:00.

MARCELLUS H. STOW

REPORT OF THE RESEARCH COMMITTEE

The Research Committee, during the past year, has acted favorably upon the following applications for research grants-in-aid:

1. Mr. Edward R. Dyer, Jr., Leander McCormick Observatory, University of Virginia: $100.00 for equipment to be used in determining space motions of certain faint dwarf M stars.

2. Mr. John Thornton Wood, Virginia Fisheries Laboratory: $150.00 to help defray expenses for field work in Virginia for the collection of herpetofauna and examination of material in the Carnegie Museum, the Philadelphia Academy of Science and one private collection in Philadelphia.

3. Mr. Lowell V. Heisey, Department of Chemistry, Bridgewater College: $100.00 for equipment to be used in an investigation of the

bactericidal, fungicidal and insecticidal properties of native Virginia flowering plants.

Eleven fine papers were submitted for the J. Shelton Horsley Research Award. Their excellence made the task of the Research Committee most difficult. The Award was given to Mr. D. B. Duncan, University of Sydney, and Virginia Agricultural Experiment Station of the Virginia Polytechnic Institute, for his paper: "A Significance Test for Defferences between Ranked Treatments in an Analysis of Variance and on the Properties of the Multiple Comparisons Test."

The following received "Honorable Mention"—(1) Mr. Robert C. Krug and Mr. George J. Hsieh, Department of Chemistry, Virginia Polytechnic Institute, for a paper on "The Reducing Action of Different Metals in Liquid Ammonia"; (2) Dr. D. R. H. Gourley, Department of Pharmacology, University of Virginia Medical School, for a paper on "Phosphate Turnover in the Human Erythrocyte".

H. RUPERT HANMER

REPORT OF THE FINANCE AND ENDOWMENT COMMITTEE

Since the Secretary-Treasurer is giving a full report of the financial status of the Academy, no detailed account will be presented here, except for the following items which may warrant further explanation.

(a) James River Project Committee—$210.82. This item was carried on the Academy books as a record; the money belongs to the James River Project and the Academy books were used only as a depository.

(b) The miscellaneous expenses of $179.26 included $142.00 for the audit, $12.50 on the premium for bonding of the Treasurer, $10.00 for flowers, and $5.00 for Corporation Registration Fee, so actually there was only $9.76 miscellaneous expenses. Most of this remainder was used in the expenses of running the Sections, a detailed account of which will be found in the Treasurer's report.

The rest of the items are self-explanatory, and each was discussed by the Committee and found in order.

After careful study of the expenses of 1950-1951, the Committee recommends the following budget for the year 1951-52:

	1950-51	Proposed 1951-52
A.A.A.S. Meeting	$ 100.00	$ 100.00
Honorarium	300.00	300.00
E.C.L. Miller Award	50.00	50.00
Junior Academy of Science and Science Talent Search	75.00	150.00
Meeting Expenses	100.00	
Audit	$ 145.00	$ 145.00
Premium on Treasurer's Bond	12.50	12.50

Stationery, supplies and stenographic services	230.00	150.00
Postage and express charges	275.00	125.00
Miscellaneous	30.00	175.00
	$1317.50	$1207.50

The Committee feels that this is the minimum budget on which the Academy, exclusive of the Journal, can operate. Indeed, the expanding functions of the Academy demand increased revenue. This need must be met.

With these explanatory remarks, the Finance and Endowment Committee recommends the following:

(1) That the proposed budget for 1951-52 be adopted.

(2) That increased effort be made to increase the income of the Academy by increasing the membership of the Academy and by greater participation on the part of members in raising the status of their present memberships to that of Contributing, Sustaining, Life, or Patron members.

ROBERT F. SMART

REPORT OF THE COMMITTEE OF THE JUNIOR ACADEMY OF SCIENCE

The Junior Academy of Science Committee continued its program of:

a. Promoting better teaching of science in high schools.

b. Recognizing worthy science teachers by providing scholarships and awards.

c. Working with the State Department of Education in promoting better facilities and better trained teachers in the secondary schools.

Mimeographed letters of information were sent to all known active Science Club sponsors, to chairmen of Science Open Houses, and to members of the Junior Academy of Science Committee, encouraging:

a. The enrollment in Science Clubs and participation in the Junior Academy Program, including preparation for exhibit contests in the Science Open Houses and at the annual meeting.

b. Club sponsors to make use of speakers on the scientific rosters.

In addition to the mimeographed materials, over one hundred individual letters were sent out to the more active Club sponsors. Replies were received from a very small percentage of the Science Clubs. In like manner, in several cases information concerning the dates of the Science Open Houses was received too late to be on the calendar of the High School League and too late to notify the Science Club sponsors.

The following Science Open Houses were held:

April 7	University of Virginia E. W. Pullen, Chairman Biology Department Charlottesville, Virginia
April 13	Medical College of Virginia Dr. Frank B. Pitts, Chairman Richmond, Virginia
April 14	William and Mary College O. F. Schuette, Jr., Chairman Department of Physics Williamsburg, Virginia
April 21 and 22	Virginia State College A. G. Macklin, Chairman Petersburg, Virginia
April 21	Mary Baldwin College Miss Mary Humphreys, Chairman Staunton, Virginia
April 28	Virginia Polytechnic Institute Dr. B. N. Cooper, Chairman Geology Department Blacksburg, Virginia

The Junior Academy Committee met in Charlottesville on January 27, 1951, formulated plans, policies, and operating procedures, and discussed the program for the Science Open House and for the State meeting in Lynchburg. According to recommendations brought out in this meeting, regulations were developed assigning each high school to a definite Science Open House. The purpose was to encourage participation in the Junior Academy program among the smaller colleges in Virginia. This procedure did not prove popular, particularly with the Wilson Memorial High School. Following the meeting of the Committee in Charlottesville an outline of the duties of a Science Open House Chairman was prepared by the Committee Co-Chairman Andrews, as requested, and mailed to all Science Open House Chairman. These duties were later modified by Co-Chairman Cooper to include the functions of the Science Open House Chairman in relationship to the Science Talent Search Program. In view of the fact that the Science Talent Search contestants will not be interviewed at the Science Open Houses in the future, the original outline of duties of the Science Open House Chairman should continue to apply.

Co-Chairman Andrews visited six high schools and three colleges and made two visits to the State Department of Education without cost to the Academy of Science. He supervised and assisted in the judging of ninety science exhibits at the Martinsville High School Science Fair. He attended the national meeting of the National Science Talent Search winners and interviewed and helped judge the contestants, all of whom

had science exhibits. It was the general consensus of opinion that science exhibits and personal interviews by judges of contestants at their exhibits is one of the most effective means of evaluating the achievement and qualifications of young scientists.

The Superintendent of Public Instruction, State Department of Education, Dr. D. J. Howard, after Dr. Andrews had visited his office, wrote a letter to the Co-Chairman of the Committee, endorsing the activities of the Junior Academy of Science. Incidentally, Dr. Howard's daughter teaches science at the Martinsville High School.

Science Clubs were found to be active in the Junior Academy of Science Program during 1950-1951. These clubs had a membership of approximately 850 members. Less than six of these clubs presented a written summary of the activities and accomplishments of the Club during the year.

Dr. B. N. Cooper, Co-Chairman, completed a rather extensive survey of the Science facilities in the secondary schools during the year and reported his activities at the state meeting in Lynchburg. A brief abstract of his report follows:

> Out of 326 questionnaires distributed, 278 were returned to the Committee. Ninety-five percent of the replies were filled out either by science teachers or by high school principals. Of the schools replying. 270 teach biology, 250, chemistry, and 55, physics. Eighty percent of the high schools have teachers reported to be specially trained in teaching science; however, only fifty-four percent of the high school teachers have a baccalaureate degree. Only eleven percent hold a master's degree, and only half of the schools indicated that the teachers were encouraged to take graduate work. Approximately ten percent of the science teachers also teach English; thirteen percent, athletics; fifty percent, mathematics; and seven percent, some additional courses other than the above-mentioned three.
>
> Forty-four percent of the high schools have special rooms for science instruction. About fifty-five percent of the high schools have a stockroom for science supplies. Only about thirty-five percent of the students have the basic items of equipment necessary for learning first-hand the basic principles of physical and biological science.
>
> Science clubs are lacking in seventy-five percent of the high schools. Nearly eighty percent indicated lack of adequate physical facilities for satisfactory instruction in science. Fifty-three percent of the schools plan to improve the physical facilities for teaching science in the next five years. Only seventeen schools reported that they have had winners in the State Science Talent Search and Science Exhibit contests. The complete results of the survey have been made available to the Junior

Academy Committee and to other committees of the Virginia Academy of Science which should use the information for the improvement of the teaching of science in Virginia high schools.

The committee held its annual meeting on May 10, 1951. Methods of improving the various phases of the Junior Academy program were discussed. In the absence of Co-Chairman Andrews, Dr. B. N. Cooper, Co-Chairman, presented awards at the annual banquet for the following winners:

Prizes consisting of $15, $10, and $5 checks for the first, second, and third best individual science exhibits were awarded to Charles Moncure, Radford; William Prillaman, Martinsville; Carolyn Evans, Martinsville; and Billy Graham. The latter two were tied for third prize and the extra prize of $5 was contributed by the Lynchburg Chamber of Commerce. Similar prizes, furnished through the courtesy of the Lynchburg Chamber of Commerce, were awarded to Jefferson High School Science Club of Richmond, Woodrow Wilson Memorial High School Chemistry Club, and Norview High School Science Club for the first, second and third best club exhibits.

Certificates for the best reports of club activities were awarded to Woodrow Wilson Memorial High School Science Club and Newport News High School Science Club.

The E.C.L. Miller Award of $50 for the Science Club judged to have made the most outstanding record in the State for the year 1950-1951 was made to the Wilson Memorial Science Club. The check was received by Mrs. B. G. Heatwole, sponsor of the winning club.

No report of award of scholarships to science teachers was announced.

On submitting his resignation as Chairman Elect of the Junior Academy Committee for 1951-1952, Dr. Andrews makes the following recommendations to the officers and committee members of the Junior Academy of Science:

1. The incoming chairman needs the willing cooperation and help of all club sponsors, Open House chairmen, and committee members in order to coordinate properly the various functions of the Junior Academy of Science.
2. Bear in mind that he has a tough job and works gratis. You can make his work more pleasant and effective by assisting in every way possible to expedite the program and by being patient when delays caused by conditions beyond his control prevent information from being sent out on time.
3. The Junior Academy Chairman needs the service of a stenographer from one-fourth to one-half time to coordinate properly the

program. It is recommended that funds be provided to pay for stenographic help.

FLOOD S. ANDREWS

REPORT OF THE COMMITTEE ON SPEAKERS' BUREAU

The mechanics of the Speakers' Bureau, as exercised in the past, continued this past year. Speakers do not get expenses paid by the high schools nor do they get remuneration for transportation or any other incidental expenses connected with the visitation. There existed no difficulty in getting speakers to make themselves available under these conditions. Those contacted seem to feel that it is something that they can do to help out the young boys in high school and also gives them a chance to present their views. I have quite a list of people and will turn them over to you, but they would have to be contacted again for any changes. Oftentimes additional speakers have offered themselves to someone in the area as anxious to be put on the speakers' list and the information gets to me via the second person.

The Virginia League of High Schools, formerly under the direction of Richard Fletcher, from their Charlottesville office has undertaken to send out the mimeographed material it would like to get to all the high school principals in the State. I think they have done more than an acceptable job in so far as there were quite a number of sheets of paper, including instructions and the list of speakers and these sheets constituted quite a lot in the envelopes they have to send out. There is reason to believe that the Virginia League of High Schools will not continue this cooperative practice.

Most of the time the high schools look over the list of speakers in their area and correspond with them directly, but there are a fair number of letters in which some high school groups will ask for assistance in contacting a speaker. In the instructions the high schools are asked to deal directly with the speaker since he is the important personage in this work.

The question is asked whether the work of the committee needs wide expansion or if we are doing enough now. The answer to that is yes and no. It has been found that some high school principals object to outside speakers coming in, stating that the speakers try to sell the idea of science to high school students and that the principal would like to keep guidance work assigned to his own staff. Of course no speaker would be worth much if directly or indirectly he did not sell himself and his ideas to his audience. The State Board of Education has been quite willing to cooperate and in some cases seems to have done all of the work, especially among the Negro high schools. The two Negro members who have regional visitations to make are quite enthusiastic and they seem to have worked quite hard when one considers the number of exhibits and the number of speakers called for.

It is rather sad to relate that the Virginia Academy of Science does not provide any funds nor any help, and the money paid out for paper, stamps, envelopes, and mimeographing amounts to between $75.00 and $120.00. The retiring chairman of the committee feels that the undertaking was worth while and has underwritten the financial burden of the work.

This expresses rather a formative, although a frank statement of the trials and vicissitudes, but the value of the services to the high school groups more than offsets any grief and expenditures.

The retiring chairman offers to serve as a member of the committee; for the last seven months there has been too much paper work and therefore less time and attention has been devoted to the Speakers' Bureau, consequently the financial burden has been lightened by the same token. The demand for speakers has been light, but the same enthusiasm on the part of the participating speakers continues.

Many principals have shunted the time of the science club meetings to after school hours, and in these cases the interest in science club work has materially suffered. There are just too many meetings and too many extra-curricular activities confronting the high school students today.

FRANK C. VILBRANDT

REPORT OF THE SIXTH VIRGINIA SCIENCE TALENT SEARCH

Five hundred and forty-seven seniors from fifty-nine high schools requested Aptitude Examinations from Science Service, which represents an increase of 102 over last year. Of these, 108 completed all requirements for competition, and from them the National Science Talent Search selected seven for National Honorable Mention. They are as follows:

NATIONAL HONORABLE MENTION

Bayne S. Bentley	Jefferson High School	Roanoke
Ada A. Blackwell	Wilson Memorial High School	Fishersville
Fay F. Dixon	Wilson Memorial High School	Fishersville
Marcella M. Eubank	Wilson Memorial High School	Fishersville
William T. Graham	Wilson Memorial High School	Fishersville
Richard K. Lyon	Washington-Lee High School	Arlington
Ellen D. Valentine	George P. Phenix High School	Hampton

The Virginia Science Talent Search Committee studied the 108 completed entries and chose 45 finalists in the State Search. These selections were based on consideration of 1) Aptitude Examination Score, 2) Essay, 3) High School Scholastic Record, 4) Teacher Recommendations, and 5) Interview Scores at Open Houses.

At the Junior Academy of Science meeting at Lynchburg College on May 10, 1951, these finalists were interviewed by panels of Judges and from among them 15 were chosen as State Winners and 30 were considered worthy to be designated State Honorable Mention, as follows:

STATE WINNERS

Name and Rank	*High School*	*Home*
1. B. S. Bentley	Jefferson Senior	Roanoke
2. R. K. Lyon	Washington-Lee	Arlington
3. Marcella M. Eubank	Wilson Memorial	Harriston
4. W. T. Graham	Wilson Memorial	Waynesboro
5. Faye F. Dixon	Wilson Memorial	Stuarts Draft
6. Ellen Valentine	George P. Phenix	Hampton
7. Ada A. Blackwell	Wilson Memorial	Staunton
8. A. J. Zuchelli	Lane	Charlottesville
9. N. McShane	Lane	Charlottesville
10. Patsy I. Wampler	Wilson Memorial	Ft. Defiance
11. Joan V. Pease	Thomas Dale	Richmond
12. R. T. Von Beck	Warren County	Front Royal
13. C. W. Denson	Warren County	Front Royal
14. D. L. Richards	Blacksburg	Blacksburg
15. Margaret A. Masincupp	Wilson Memorial	Staunton

STATE HONORABLE MENTION

Name	*High School*	*Home*
T. F. Armstrong	Thomas Jefferson	Richmond
N. Beachley	Washington-Lee	Arlington
J. W. Bragg	Thomas Jefferson	Richmond
Peggy A. Carico	Castlewood	Castlewood
R. H. Crewdson	Warren County	Front Royal
G. Dickerson	Highland Springs	Sandston
Mary S. Foley	Thomas Jefferson	Richmond
R. H. Giles	E. C. Glass	Lynchburg
H. B. Hollinger	Warren County	Front Royal
Norma M. Howard	John Marshall	Richmond
Orian F. Langley	Booker T. Washington	Norfolk
M. G. Levy	Newport News	Newport News
Peggy A. Lloyd	Wilson Memorial	Waynesboro
J. H. Marion	Thomas Jefferson	Bon Air
R. R. Mitchell	Maury	Norfolk
Patricia A. Murray	John Marshall	Richmond
Barbara A. Neblett	Thomas Jefferson	Richmond
Catherine Newbill	Newport News	Newport News
W. F. Peach	Newport News	Newport News
G. F. Reese	Wilson Memorial	Staunton
H. Richards	Blacksburg	Blacksburg
Shirley J. Sawyer	Newport News	Newport News
L. J. Shipman	Norview	Norfolk
D. H. Stern	John Marshall	Richmond
M. L. Stockner	Warren County	Front Royal
Owen Thomas, III	Lincoln	Round Hill
R. B. Thomas	Jefferson	Roanoke
J. M. Warner	Norview	Norfolk
Melba L. Watkins	St. Catherine's	Potsdam, N. Y.
A. L. Wurtzel	Thomas Jefferson	Richmond

Winner of the Major W. Catesby Jones Award for the best essay in chemistry was Marcella M. Eubank for paper titled "Reactions in Gels."

PHILIP C. SCHERER

REPORT OF THE COMMITTEE ON THE EXCHANGE OF FOREIGN STUDENTS

The 1950 report of our Committee showed that there were 26,000 overseas students in the United States in the academic year 1949-1950, whereas now the authentic statistics indicate that the number has increased to over 30,000. Of this number only about 7,000 are women.

The total number of foreign students in Virginia institutions of higher learning at present is 220. This shows an increase in number over the 177 students from abroad in this state in 1948-1949, and the 197 in 1949-1950. Of these students 141 are men and 79 are women. In the year before this, only eight institutions had five or more students from abroad, whereas now thirteen Virginia institutions are on this honor list. They are as follows, in comparison in this respect with the statistics for last year:

Institution	1950-1951	1949-1950
Virginia Polytechnic Institute	36	38
University of Virginia	34	23
Eastern Mennonite College	23	23
College of William and Mary	15	4
Hampton Institute	11	15
University of Richmond	11	10
Virginia Union University	9	10
Virginia Military Institute	8	0
Virginia Intermont College	7	0
Washington and Lee University	7	5
Shenandoah College	5	0
Sweet Briar College	5	2
Union Theological Seminary	5	4

This increasing number of overseas students now with us in Virginia come from 52 different countries, as against the 47 countries represented in last year's list. These countries and the number of their students are:

China	30	Colombia, Cyprus, Denmark, Gold Coast, Iran, Korea, Mexico, Netherlands	3 each
Canada	28		
Cuba	19		
Germany	13		
Venezuela	10	Argentina, Austria, Belgium, Ecuador, Greece, Guatemala, India, Israel, Panama, Peru, Philippines, Turkey, Union of South Africa	2 each
Great Britain	8		
Brazil	7		
British West Indies	7		
Japan	6		
France	5		
Nigeria	5	Chile, Costa Rica, Czechoslovakia, Haiti, Italy,	
Sierra Leone	5		

Honduras, Liberia, Netherlands Antilles	4 each	Kashmir, Latvia, Lebanon, Malaya, Nicaragua, Paraguay. Poland, Switzerland, Syria, Vietnam	1 each

The great increase in the number of foreign students in recent years is due largely to the extensive programs supported by funds from different governments, including our own, to enable students to go abroad for higher studies. Until recently governments have supported their young men and women for study abroad chiefly in Engineering, Medicine, and the physical sciences. One of the most significant facts concerning the fields of study of the 1950-1951 foreign students is the increase in the number now coming to this country to pursue graduate study in the Social Sciences. At the present time there are almost as many overseas students working in the Social Sciences (5,617) as in Engineering (5,810), which is the discipline claiming the largest number. Until this academic year medicine regularly ranked second in the list of fields of study.

The significance of the foreign student movement obviously transcends statistics. Every academic and civic community has a great challenge and a deep responsibility with respect to the students from other countries, whether they are in the graduate or undergraduate categories. The enlightened resources of the community should be brought to bear in the academic and non-academic phases of community life so that the needs of these student guests will be adequately met. It is by no means sufficient that these young people from other lands should have merely a successful academic experience. If that is the sum total of their advantage, much of the fundamental values of intercultural exchange will not be gained. The purely academic should be supplemented by fruitful experiences in the civic, industrial, recreational, religious, and social phases of American life.

EDGAR J. FISHER

REPORT OF THE MEMBERSHIP COMMITTEE

The Academy membership has not progressed as well as hoped for this year. The increased loss of members, however, reflects the change in the Constitution, which dropped all members in arrears for one year, rather than the three years allowed under the former Constitution. Ninety-two of the total lost this year is due to those members dropped under the new Constitution ruling.

For the past year from April 1, 1950 to April 1, 1951, the Academy has gained only 139 members, classified as follows:

Student Members	34
Regular Members	105
TOTAL	139

During the year the Academy lost several members by death, the names of which are contained in another report.

The recapitulation of the total membership is as follows:

Members last year	1204
Members lost last year, classified as follows:	
Student members	34
Regular Members	128
Deceased	7
TOTAL	149
New Members in 1949-50	139
Net Loss	10
Present Membership of the Academy	1194

FOLEY F. SMITH

REPORT OF THE RESOURCE-USE EDUCATION COMMITTEE

The resource-use education activities included in the reports of the last three years have been continued or expanded. Likewise, the problems previously emphasized continue to persist.

On account of space limitations only new or expanded activities are listed in this report. Some of the more significant resource-use education activities listed by certain members of the Committee are as follows:

1. In August, 1950, the Extension Service operated its first forestry school for county agents. Forty-four agents attended this one-week school held at Holiday Lake.

2. Farm forestry is now included in the curriculum of Vocational Education at Virginia Polytechnic Institute.

3. Through the Game and Inland Fisheries Commission's audio-visual service program, countless educational motion picture films have been made available to clubs, schools, and miscellaneous meetings.

4. An effort has been made by the Game and Inland Fisheries Commission to provide schools and the public with resource-use reference material. Five thousand copies of the Commission's latest publication, the 72-page booklet "Birdlife of Virginia," will be distributed to the schools through the State Board of Education.

5. Within recent months consideration has been given to the idea of providing a summer workshop in which agriculture teachers of the Tidewater area will study fisheries so that they may present fishery conservation to their pupils.

6. A modern exhibit room was planned and developed in the new Virginia Fisheries Laboratory building at Gloucester Point. This exhibit, opened officially with the dedication of the Laboratory on October 12, 1950, contains displays on ancient marine fauna of the seas that covered Tidewater Virginia during much of the Miocene Age; displays on the use of marine resources by the tribes of Indians that inhabited the lower

York-James before the settling of Jamestown Island; and displays on our rich and varied marine fauna of today.

7. Marine Life Resource-Use was taught for one week as a part of the class work in General Biology, Comparative Anatomy, and Botany at Radford College to approximately three hundred students.

8. It was reported by one of the Committee members representing a National Forest that the "food cycle" idea has been used as a method of approach in teaching Conservation to a number of groups—men, women, and youth.

9. A course in applied science, which emphasized conservation education, was taught at the University of Richmond last summer.

RECOMMENDATIONS

Some of the recommendations suggested by certain members of the Committee are as follows:

1. It is recommended that the State of Virginia establish a Resource-Use Education Commission, or Advisory Council. This Commission, or Council, should be composed of official representatives of state and federal land-use agencies and the State Board of Education. It should serve to advise the Governor and the General Assembly, and the agencies represented concerning matters pertaining to Conservation Education, its need, and ways and means of coordinating the total conservation effort.

2. It is recommended that Virginia's institutions of higher learning include in their teacher-training curricula one or more fundamental courses in the conservation of natural resources. It is also recommended that all teachers graduating from such institutions be required to have had at least one full course in Resource-Use Education before a teaching certificate is granted.

3. The Committee wishes to urge the State Board of Education to add to its staff a trained, full-time Conservation Education specialist to help coordinate Conservation Education activities in the public school system.

4. The committee wishes to urge the State Board of Education to promote Conservation or Resource-Use Education workshops each summer for the benefit of instructional personnel of public schools.

ALFRED L. WINGO

REPORT OF THE COMMITTEE ON VIRGINIA FLORA

Three members of the Committee report individual activity relative to the study of plant life in the state. P. M. Patterson has continued activity in the study of the moss flora. He has completed a study of the mosses from eastern Virginia collected by Mr. Bayard Long, who accompanied Dr. Fernald on frequent trips in eastern Virginia. Dr. Patterson has published several papers relative to the mosses

Miss Lena Artz is actively engaged in the botany of the Massanutten Mountains. Some of her work is reported in a paper in CASTANEA 15:131-134 and Notes in the Virginia Journal of Science 1:145-146.

A. B. Massey is actively engaged in developing an annotated check list of the plants of the state. This is based on the eighth edition of Gray's Manual of Botany and is a preliminary to a state flora which we hope to develop in the future. The V.P.I. herbarium of the state flora is to be better housed. A special room has been assigned to it. The herbarium is filed in several large all-metal cases; however, additional cases are needed to care for the present collection properly, and to allow for the near future. The new arrangement will place the herbarium where it will be accessible throughout the day.

A. B. MASSEY

REPORT OF THE COMMITTEE ON VIRGINIA FAUNA

In recent years the Fauna Committee under the chairmanship of Dr. Horton H. Hobbs has stimulated new interest in increasing our knowledge of the Virginia fauna. The objectives of the Committee broadly stated are (1) to increase the facilities available to specialists who are studying the Virginia fauna, and (2) to disseminate the information gathered by these specialists to the people of Virginia through keys, handbooks, literature lists, and identification services.

Some of the projects now in progress which are aimed at furthering the first objective are these:

1. A directory of people actively working on the Virginia fauna and the type of material they want from collectors. This directory will be revised this coming year, and interested persons should contact some member of the Fauna Committee.

2. Systematic files on Virginia fauna have been established at the University of Virginia (land and freshwater species) and the Virginia Fisheries Laboratory (brackish water and marine species). Contributions to these files are solicited since they are maintained by voluntary work. They are also open to anyone seeking information on a group or species.

3. A few people are actively collecting for group specialists located in and out of the state. Many more pairs of hands are needed and it is hoped high school teachers and students as well as other groups will aid in this project.

The facilities for disseminating information are gradually increasing. The resumption of the publication of THE VIRGINIA JOURNAL OF SCIENCE was a big step. The completion of the new building for the Virginia Fisheries Laboratory in the past year provide a center from which marine and brackish water studies maybe carried out. Already many high school groups and several college groups have visited the exhibit room and taken guided field trips from this laboratory.

The Committee wishes to call attention, because of its application to

our own state, to a very important book recently published by our sister state, North Carolina. The book, edited by Harden F. Taylor, is entitled *Survey of Marine Fisheries of North Carolina.*

J. D. ANDREWS

REPORT OF THE VIRGINIA JOURNAL OF SCIENCE

The Editorial Staff has worked hard in producing your Journal which is now recognized as one of the leading Journals of the state academies throughout the United States. The Technical Editor, Dr. Horton H. Hobbs of the University of Virginia merits especial recognition for his excellent work in editing the Journal. There is no other scientific journal that is being published for two dollars. Your cooperation will assist the staff in maintaining this minimum cost of publication. Some of the things which will assist us are as follows:

1. Send your change of address to the Editor-in-Chief, Virginia Journal of Science, Blacksburg, Virginia, at least six weeks before the next issue of the Journal;
2. Pay your dues before January 1 so that there will be no lapse in your subscription;
3. Submit to the Journal a scientific paper for publication; and
4. Send to the Section Editor any scientific news which may be interesting to the membership.

BOYD HARSHBARGER, *Editor-in-Chief*

AUDIT OF THE JOURNAL

Editor-in-Chief
Virginia Journal of Science
Blacksburg, Virginia
Dear Sir:

The audit of the financial accounts of THE VIRGINIA JOURNAL OF SCIENCE included verification of receipts and expenditures and money on deposit with the Farmers and Merchants National Bank of Blacksburg, also a verification of accounts receivable and accounts payable. I found it necessary to set up two subsidiary accounts to cover Advertising and Extra Page Charges. I feel that these two accounts will give a little closer check on these two phases of the operations of the Journal.

While I have found that the accounts were accurate and the records were being satisfactorily kept, there are several recommendations which I would like to make which I feel would be advantageous to the Academy.

1. If I remember correctly, when the Journal was revived the members of the Academy were asked to donate $2 for a two-year period to insure the success and continued publication of the Journal. The total amount of these donations is $1380.50, and is carried in the regular checking account of the Journal. I feel, since it is evident that the Journal can be published from the funds received from the Academy subsidy, advertising, and the Alderman Library subscription, that the

$1380.50 should be taken out of the checking account of the Journal and transferred to a savings account. If this is done the money will earn a small amount of interest and will be available in the future if an emergency, not now foreseeable, should arise. My statement, that the Journal can be published from the regular income, is based on the results of the audit which show a net profit for the year of $180.13.

Further, it might be well for the Editorial Board to consider setting aside each year a small sum of money from profits realized during the year's publication of the Journal, this sum to be added to the $1380.50 previously mentioned. This would further insure publication of the Journal at some future time when income from the Academy may not be as satisfactory as it is now.

2. I am a bit concerned about the system in use for the determination of those members of the Academy to whom the Journal should be sent. In checking the number of Journals sent against money received from the Academy, I find the following to be true:

a. The January issue of the Journal was sent to 708 members and at that time money had been received for only 641 members. There is an apparent loss here of $134 to the Journal.

b. The April issue of the Journal was sent to 776 members and money had been received for only 747 members. I have no way of knowing whether this constitutes an additional loss to the Journal or whether part of it is included in the $134 mentioned in *a* above.

The By-Laws of the Academy have set January 1 as a deadline for payment of dues in so far as receiving the Journal is concerned. I recommend that on January 1 the Journal be sent a list of all members in good standing and at the same time be sent a check which would cover the numbers of names sent. When additional names are sent they should be accompanied by a check covering in full the number of names. I would further recommend that the Journal not be sent to any one for whom the Academy has not paid the $2 subsidy.

3. In checking the number of Journals printed against the number to whom it was sent, I find what I believe to be an excessive overprint. The total number of Journals distributed in July, 1950, was 1124; in September, 1138; in January, 1951, 866; and in April, 935. I understand that the contract with the printer calls for 1500 copies of each issue. I feel it would be advisable that in negotiations for next year's contract that this number be reduced to say approximately 1200 minimum with some type of option clause put in so that a specific number of copies could be ordered for each Journal printed. This year circulation varied from 1138 maximum to 866 minimum, a difference of 272 copies, and there were 1500 copies printed of each issue.

I feel that a more complete check on the list of the members to whom the Journal is to be sent (as mentioned in section 2 of this letter) and a varying number of copies printed for each issue will enable the Journal to effect some small savings which, of course, will be desirable.

JOE W. GUTHRIDGE, *Auditor*

VIRGINIA POLYTECHNIC INSTITUTE
STUDENT ACTIVITIES OFFICE AUDIT REPORT FOR VIRGINIA JOURNAL OF SCIENCE

RECEIPTS:	
Donations from Members	$ 572.00
Donations from Contributing Members	2.50
Donations from Sustaining Members	12.00
Academy Subsidy	1494.00
Advertising	455.50
Alderman Library	150.00
Subscriptions	63.00
Charges for Extra Pages	231.32
Sale of Extra Copies of the Journal	16.08
Special Donation	5.00
Total of all Receipts	$3001.40
EXPENDITURES:	
Printing of Five Issues of the Journal	$1954.10
Reprints of the Lead Article	163.43
Mailing Expenses of the Journal	176.99
Engraving	228.39
Stationery	27.50
Miscellaneous	5.00
Total of all Expenditures	$2555.41
STATEMENT OF CASH ACCOUNT:	
Balance of Cash at Beginning of Year	$2162.33
Total Receipts for Year	3001.40
Total Cash on Hand During the Year	5163.73
Total Expenditures for the Year	2555.41
Balance of Cash at End of the Year	2608.32
Accounts Receivable	420.64
Balance as of May 8, 1951	$3028.96

AUDITED by Joe W. Guthridge, May 8, 1951

While the current year has been a trying one for the Editorial Staff of the Journal, we are happy to report to the Academy that with the publication of the April issue of the Journal on April 16, 1951, we are no longer behind schedule.

We deeply regret that the Proceedings and the January number of the Journal were late in being released from the printer; however, circumstances beyond our control prevented an earlier publication date. It is our hope that such delays may be avoided in the future.

Four numbers of the Journal have been published since our last report was made to the Academy. Within these issues three articles having a general appeal are presented: One deals with the impact of atomic energy on education; the second presents recent developments in molecular physics, and the third includes a brief summary of the development of the science of Bacteriology. In addition to these, 17 papers presenting original research are included in the three numbers.

The Commonwealth Press, Inc., under the former management of The Radford News Journal has been awarded the contract for printing the Journal for the current year. The cost for a regular page is $3.50 for 1500 copies, and $6.00 for tabular material or pages bearing equations. The Editorial Board, with the approval of the Council, has agreed that within the six pages allowed the author for each article, he may include no more than one page of tabular material or equations unless he is willing to assume the difference in cost (i.e., $3.50 or $6.00 for each additional page of such printing).

It is hoped that during the ensuing year we may be able to expand our advertisements. At the present time we have the equivalent of three pages, and it is our goal to double this number. With the growing prestige and circulation of the Journal it does not seem that our aim in this respect is too ambitious.

We now have some half-dozen manuscripts in our files, which will insure a full issue in July.

HORTON H. HOBBS, *Technical Editor*

REPORT OF THE COMMITTEE ON PLACE OF MEETING FOR 1952

In attempting to arrange a place of meeting for the Academy in 1952, the committee has been guided by the suggestion of President Horsley that it would be appropriate for the meeting to be held in the Tidewater section and preferably not in Richmond.

After investigation of various possible meeting places the committee concludes that the Chamberlin Hotel at Old Point offers the most suitable facilities for an Academy meeting. The College of William and Mary has indicated its willingness to sponsor the 1952 Academy meeting if it can be held in the Old Point area, and the William and Mary-V.P.I. Division at Norfolk has also expressed a desire to be included in the sponsorship of the meeting.

The committee therefore recommends that the Thirtieth Annual Meeting of the Virginia Academy of Science be held at the Chamberlin Hotel, Old Point Comfort, on May 8, 9, and 10, 1952, and that we accept the sponsorship of the College of William and Mary and the Norfolk Division for this meeting.

W. G. GUY

REPORT OF THE VIRGINIA INSTITUTE FOR SCIENTIFIC RESEARCH

Although the total resources of the Institute are still small, its second year of operation has been a successful one. The outstanding accomplishment of the year has been the stabilization of the organization and the working out of a practical system for planning, estimating, and executing sponsored research.

Research Activities during the Past Year: Research has been carried out largely in three fields. The study of the mechanics of the electroplating of nickel for the Harshaw Chemical Company has been continued. It is believed that important results have been obtained, but the project is a confidential one and the results cannot be disclosed. In April Dr. Leidheiser presented a paper before the Electrochemical Society in which he described those results on nickel electroplating which could be publicized. The second line of study consists of the preparation for other laboratories of large metal crystals of special shapes and sizes. Crystals have been prepared for the Atomic Energy Commission, the National Advisory Committee for Aeronautics, the Westinghouse Electric and Manufacturing Company, the Signal Corps, and several educational institutions. The third line of study has consisted of an effort to electroplate titanium. There are large deposits of titanium ore in Virginia and the metal itself has many desirable properties which will increase its use in the future. Thin electrodeposits have been obtained, but deposits of a satisfactory thickness for protection of the underlying metal have not yet been obtained. A few experiments have been carried out, largely in connection with proposals for future projects, on the Fischer-Tropsch synthesis of hydrocarbons from carbon monoxide and hydrogen. The rate of total research expenditures at the present time is approximately $30,000 a year.

Present Staff: The staff consists of a total of seven, as follows: four full-time research employees, Dr. Leidheiser, and Messrs. Straughan, Roth, and Denise; a machinist, Mr. Hayes, who works almost full-time; the secretary, Miss McElroy, who works about half-time; and a man who comes in about two days a week for cleaning and odd jobs. The Institute is greatly indebted to its members for their fine work and loyalty and also to Dr. Robert Kean, Secretary and Treasurer, who without remuneration keeps all of the financial accounts of the Institute.

Plans for the Future: Past studies have necessarily been concerned with the properties of metal surfaces because of the experience of our staff in this field and because such studies could be carried out with a minimum of equipment. Although efforts are being made at the present time to expand these studies, yet a special effort is also being made to initiate studies in other fields. Thus an attempt is being made to raise funds for the purchase of an ultracentrifuge in order that the Institute might undertake both medical and industrial studies concerned with the determination of molecular weights and particle sizes. An effort is being made to obtain sponsorship for a sizeable project on the catalytic synthesis of hydrocarbons from carbon monoxide and hydrogen. Negotiations are being carried out with one industrial concern for the determination of molecular weights of certain raw materials with the aid of the ultracentrifuge.

During the past year the Institute was unsuccessful in an application to a national foundation for a grant to be used for the purchase of basic

research equipment. The grant was declined on the grounds that the immediate purpose of the Institute was not immediately related to educational purposes, which was the primary concern of the foundation.

ALAN T. GWATHMEY

REPORT OF THE COMMITTEE ON ACTIVITIES FOR COLLEGIATE MEMBERS

The Collegiate Members of the Academy held their first organized meeting on May 12, 1950 at a luncheon at the Hotel Roanoke. Including the visitors, there were over a hundred present. Following the luncheon, the students had a long meeting and decided to work actively for the establishment of additional chapters in the colleges of the state. A working Committee, consisting of students of the various colleges represented, was formed and a meeting of this committee was planned for later in the year, to be held on the V.P.I. campus.

On April 20, 1951, Mr. William Kilgore, Hampden-Sidney; Mr. William Hieher, Washington and Lee; Miss Dorothy Moseley, Radford College; Mr. Charles Dorsey, Virginia Military Institute; and Mr. Robert Barham, Virginia Polytechnic Institute; met on the V.P.I. campus and for two days discussed the future of the Collegiate Chapter idea. Mr. Harshbarger met with the committee on one occasion and outlined the advantages of affiliation with the Academy. The chairman of the committee, Mr. William Kilgore, will report the findings of the group to the Collegiate Members when they meet at the luncheon at Lynchburg College on May 11, 1951 at 12:30 p.m.

We hope that, with the increased student interest shown this past year, the organization of Collegiate Chapters will go forward.

JOE W. GUTHRIDGE

REPORT OF THE JAMES RIVER PROJECT COMMITTEE

"The James River Basin—Past, Present, and Future" has been received by the press with great enthusiasm and the highest praise. A few excerpts from newspaper editorials, magazine book reviews, and opinions of columnists should enable members of the Academy to appreciate the reception accorded their book throughout the state and nation.

Four of Virginia's newspapers made the following editorial comments:

Lynchburg *Daily Advance*: "Libraries, schools, industries, chambers of commerce will find this monograph indispensable. And all Virginians who become familiar with it will be grateful to the men who conceived the idea of the study and to those who have brought it to publication. The Virginia Academy of Science has placed the Commonwealth deeply in its debt. It would be pleasing, and just, if Governor Battle gave this the formal recognition of an official statement to that effect."

Petersburg *Progress Index*: "Never before has such a variety of reliable information about the James River basin been served in one helping. It is a credit to Virginia scholarship and more especially to the Virginia Academy of Science. . . . "

Richmond *Times-Dispatch*: "Seldom has any geographical area figuratively been placed under a microscope and examined in so thorough a manner as the Virginia Academy of Science has examined the James River basin."

Norfolk *Virginian-Pilot*: "The survey is so thorough it is believed to be the only one of its kind yet achieved about any river in America."

Magazines of state and national circulation gave these evaluations in book reviews:

Science: "The Virginia Academy of Science is to be congratulated on such an excellent contribution to the ever-expanding culture of the South."

"The concept of surveying natural resources within physiographic rather than political boundaries has been aptly exploited by the James River Project Committee. The results are highly satisfactory; in fact, the completeness and generally high caliber of the coverage of each division leave little to be desired. Considering the immense difficulties of consummating the survey, it can boast of few competitors in the United States."

Nature Magazine: "It would seem that nothing one would wish to know about the historic valley of the James has been overlooked in this splendid volume, which is available at an amazingly low price for these days."

Journal of Southern Research: "This is a work of which the Virginia Academy can well be proud. Into it has gone ten years of effort by scores of Virginia scientists, educators, and industrialists."

Virginia and the Virginia County: "This book, sponsored by the Virginia Academy of Science, will no doubt take its place among valuable reference works and books of general interest. No Virginian should be without a copy. Like ivory and old gold, it will become more valuable with time."

Two writers of columns in Virginia newspapers made the following appraisals:

Freer in "The Rambler" (*re* Justus Cline) in the Lynchburg *News*: "The book provides within one set of covers a hoard of information heretofore widely scattered or perhaps even unpublished. While not a history of Virginia in the true sense, there is much valuable historical material in it. It is an undertaking which will have great value for years to come, and of which Virginians may be very proud."

Gwathmey in *Gun and Rod*, Richmond *Times-Dispatch*: "There was a noble concept which prompted the Academy of Science to pursue its exhaustive studies. Pause and reflect in the march of progress! That is

the essence. It is fitting, here in the river basin in which white civilization first got its start in this country, that a searching examination should be made of what changes have taken place in the environment of man in these past 343 years."

One individual's observations are worthy of record; a Patron of the Academy writes: "I found it fascinating. It is indeed a pioneering venture. I do not know of anything quite like it that has been published. . . . Curiously, the new Sacramento State College has undertaken a similar work."

Publicity for the sale of the books is summarized herewith:

Five hundred letters were mailed to libraries in all southern and several eastern states.

Ninety-eight letters were mailed to Virginia State Chambers of Commerce.

Nine hundred notices and order cards were sent to members of the Academy.

An unknown number of leaflets and order cards were sent to individuals.

Press publicity (as far as known) consisted of seven book reviews, four newspaper editorials, and twenty newspaper articles. Effectively these represented free advertising as nearly all mentioned the price of the volume and where it could be purchased.

One paid advertisement was inserted in the Journal.

In spite of the gratifying reception by the press and the extensive publicity given the book, sales have been most disappointing. Possibly there has been a degree of overoptimism, but the following financial statement and statistics will give members of the Academy an opportunity to judge this for themselves.

Total books received from the binder	2211	
Distribution as of April 30, 1951:		
Complimentary copies to authors, press, et cetera	155	
Sold, payment received at $6.00	218	$1308.00
Sold, payment due at $6.00	8	48.00
Total distributed	381	
Total cash received		$1308.00
Deposits in People's National Bank, Lexington, Virginia		1308.00
Total expenditures charged to monograph account (See statement herewith)		183.94
Balance on deposit in People's National Bank, Lexington, Virginia		1124.06
Expenditures per book distributed		0.47
Expenditures per book sold		0.80

Members of the Academy should be interested in the following breakdown of sales.

Purchased by individuals not members of the Academy	35%
Purchased by libraries	34%
Purchased by industries and research organizations	16%
Purchased by Academy members	14%
Purchased by Virginia Chambers of Commerce	1%
Total	100%

EXPENDITURES:

June 6, 1950	
Check #1: Postmaster—stamps	$ 20.00
June 19, 1950	
Check #2: Postmaster—order cards	10.00
July 1, 1950	
Check #3: Rockridge Co. *News*—printing order cards	11.60
July 6, 1950	
Check #4: Postmaster—stamps	10.00
July 21, 1950	
Check #5: Postmaster—stamps	27.03
July 22, 1950	
Check #7: Radford *News-Journal*—500 reprints Negus article in the *Journal*	12.50
August 6, 1950	
Check #6: Journalism Press Lab.—3000 reprints of two editorials	25.00
September 13, 1950	
Check #7a: Typing and stuffing 500 envelopes to libraries	15.75
September 13, 1950	
Check #8: Postmaster—stamps	15.03
October 2, 1950	
Check #9: Postmaster—stamps	12.00
January 6, 1951	
Check #10: Postmaster—stamps	25.03
Total expenditures	$183.94

MARCELLUS H. STOW

Motion was made by Marcellus Stow, properly seconded and passed that the Virginia Academy of Science offer its facilities to the Governor's Advisory Council, to provide the committee with any scientific information that might be required in its various studies.

Mr. George W. Jeffers read a letter from the Science Teachers of Longwood and Madison Colleges, to J. Blair Buck concerning certification of Science Teachers, in which they viewed with alarm the difference in requirements such as - 12 hours credit in physics, but required 45 hours credit for teachers of domestic science. After much discussion the

Conference recommended that the Virginia Academy go on record as approving the stand taken by these science teachers and so advising the State Department of Education.

The changes of the Constitution and By-laws made by the Council in Roanoke in 1950, and published in the January issue of the Virginia Journal of Science were accepted by the Conference on proper motion and second.

In the report of the Finance Committee it was recommended that the honorarium of the Secretary be increased from three hundred ($300.00) to four hundred ($400.00). However, as Walter Flory pointed out, this was in violation of the By-laws, and could only be increased by proper change in the By-laws. It was then moved and seconded that Section 3 of the By-laws concerning "Reimbursement of Officers" should be changed to read "four hundred ($400.00) per year" instead of three hundred ($300.00) and publication in the Proceedings of the recommended change to be considered proper notice to the membership as required by the Constitution.

It was properly moved, seconded, and passed, that recommendations in the report of the Resource-use Committee be adopted, and all the proper State Agencies be notified that the Academy approved of these recommendations.

It was moved by Sidney S. Negus, and properly seconded, and unanimously passed that the Staff and Editorial Board of the Virginia Journal of Science be commended by the Conference for their outstanding work, and for the success of the Journal for its first full year. Copies of this motion to be sent to Boyd Harshbarger, Horton H. Hobbs, Jr., Mary E. Humphreys and Clinton Baber.

On proper motion, which was seconded and passed, the Conference accepted the report of the Place of Meeting Committee, which recommended that the 1952 meeting be held at the Chamberlin Hotel, Old Point Comfort, Virginia, the second week in May. The extension divisions of the College of William and Mary and Virginia Polytechnic Institute at Norfolk, will serve as Co-hosts. By unanimous vote, the Conference extended the thanks of the Academy to the Local Committee on Arrangements for their excellent work. There being no further business the Conference adjourned at 11:00 P. M.

FOLEY F. SMITH, *Secretary.*

Report of the Luncheon of Collegiate Members

A luncheon meeting for members of collegiate chapters and other collegiate members of the Virginia Academy of Science was held in the college dining room, Westover Hall, Lynchburg College, at 12:30 p.m., on Friday, May 11, 1951.

Although there seems to be a disappointingly small attendance of collegiate members, students from the following colleges were recognized on the chairman's roll-call: Emory and Henry, Hampden-Sydney, Hollins, Longwood, Lynchburg, Madison, Randolph-Macon Woman's College, Roanoke, Sweetbriar, University of Richmond, V.M.I., V.P.I., and Washington and Lee. A large percentage of the members of the Committee on the Activities for Collegiate Members were also present, as were President-Elect Patterson and Secretary-Treasurer Smith; in the absence of the committee chairman, Joe Guthridge, Dr. Paul A. Walker served as chairman for the day.

The first order of business, after the roll-call and the introducing of the members of the committee and Academy officers, was a report, by Robert Barham of V.P.I., covering the meeting held at Blacksburg on April 20 and 21 of certain collegiate groups which had already organized. This meeting was called by Mr. Charles Dorsey, of V.M.I., for the purpose of discussing the proposal to form collegiate chapters of the Academy at the various schools, and was addressed by President Harshbarger. The discussion centered on the dual theme: what can we do for the Virginia Academy of Science, and what can the Academy do for us? At the conclusion of this meeting, the student representatives elected the folowing to serve as a Steering Committee for the "Collegiate Section" of the Academy: William Kilgore (Hampden-Sydney) as Chairman, Charles Dorsey (V.M.I.), Robert Barham (V.P.I.), Dorothy Mosely (Radford), and William Mieher (W. and L.).

President-Elect Patterson then addressed the group, stressing how important it is to the Academy to have a younger, interested collegiate group in attendance at the Academy meetings, and active on their own campuses throughout the year. He outlined the steps necessary for the establishment of a collegiate chapter, and emphasized the fact that, for a chapter to be a success the initiative should be with the students. He felt that the first step should be the establishment of a science club which is in is own right a going concern, and that after this had been done, the Council, on petition by the group to the Academy president, could decide the question of affiliation.

There then followed a general discussion of the activities of the committee during the past year. The point was made that if there are already functioning science clubs on various campuses, scientific fraternities and the like, these clubs should be welcomed as the basis for new chapters. The question was also raised as to why there was so small a turnout at the luncheon, and so few chapters already established in the

various Virginia colleges. One point made in discussion was that the information and publicity with regard to the present meeting had not been adequate, and several of the students felt that if more publicity could be given to the whole movement, not just at Academy meetings but throughout the year from time to time, the result would be more interest and activity on the part of the students, whether members of collegiate chapters or merely collegiate members of the Academy.

With regard to programs for science clubs, the services of the Academy Speakers Bureau were brought in again, and suggestions were made, such as the following: the A.A.A.S. at one time did have a microfilm library, through which several groups might secure films on various subjects; the Esso Company has several good scientific films, with projector and operator, available for any group, and many of these are on sound scientific subjects.

The group went on record as favoring the idea of having a section of its own for the presentation of student papers or demonstrations, provided enough such could be arranged. It was felt that the idea of having such a separate meeting would tend to encourage greater productivity along this line throughout the year, and that this would serve as the main "line" for the publicity to be sent to the various campuses. It was also decided that a Central Committee should be established, consisting of a student member from each chapter, and a faculty advisor from each chapter of the Collegiate Section, and that the Secretary-Treasurer of the Academy also be a member of this committee. This committee is to serve as a sort of middleman between the chapters and the Academy. President-Elect Patterson then pointed out that in the Steering Committee elected at the April meeting in Blacksburg, an efficient committee is already in existence, and suggested that these students continue as the Central Committee of the Collegiate Section; Mr. William Kilgore, of Hampden-Sydney, would then become, in effect, president of the Collegiate Section.

In conclusion, it was decided that in spite of the fact that but few chapters have been established up to the present time, with the Academy on record as supporting the movement there should be a continuance, during the coming year, of attempts to organize additional chapters. Furthermore, during the year all efforts should be bent toward arranging for a separate meeting of the collegiate group at next year's Academy Meetings; at this meeting, it is hoped, students from all Virginia campuses will present papers or give demonstrations.

PAUL A. WALKER

Minutes of the Dinner Meeting

President Horsley presided at the dinner meeting, Friday, May 11, held in the Gymnasium of Lynchburg College, Lynchburg. Dr Horsley introduced the members at the Speaker's table after a welcome was extended to the members of the Academy and guests by Dr. Orville Waks, president of Lynchburg College.

After the remarks by Dr. Horsley in response to the welcome, Mr. John Forbes, made the report for the Research Committee, on the J. Shelton Horsley Award. Two papers received "Honorable Mention": "The Reducing Action of Different Metals in Liquid and Ammonia," by Mr. Robert C. Krug and Mr. George J. Hsieh, Department of Chemistry, Virginia Polytechnic Institute; and "Phosphate Turnover in the Human Erythrocyte," by Dr. D. R. H. Gourley, Department of Pharmacology, University of Virginia Medical School. Eleven fine papers were submitted for the J. Shelton Horsley Research Award, which was given to Mr. D. B. Duncan, University of Sydney, and Virginia Agricultural Experiment Station of the Virginia Polytechnic Institute, for his paper: "A Significance Test for Differences between Ranked Treatments in an Analysis of Variance; the Properties of the Multiple Comparison Test." Mr. Duncan gave a brief resume on the objectives outlined in his paper.

The report of the Committee on Resolutions was read and adopted, as was the report of the Committee on Place of Meeting in 1951. The Hotel Chamberlin, Old Point Comfort, Virginia, was selected as the meeting place for the Academy in 1952, on May 8, 9, 10. [Editor's Note: Due to a conflict after the adoption of this report, it has been decided by the Council to hold the meeting at the Chamberlin on May 15, 16, and 17, instead of the 8-10.]

Following these reports, Dr. Sidney S. Negus, chairman of the Nominating Committee, presented the report of this committee, nominating for president, Paul M. Patterson; president-elect, Lloyd C. Bird; secretary-emeritus of the Academy, E.C.L. Miller; secretary-treasurer, Foley F. Smith; and I. G. Foster, member of the Council to succeed Edward Harlow.

On proper motion it was seconded and passed that the nominations be closed, and the report of the Nominating Committee was unanimously accepted.

The thanks of the Academy was extended to Mr. Harlow for his work on the Council during his five-year term of office.

W. E. Trout presented the report of the Resolutions Committee. The following resolutions were adopted:

Be it resolved that the Virginia Academy of Science record its grateful appreciation to its host, Lynchburg College, to the administration,

faculty, and students, for making available not only the entire physical plant, but also their own time, energy, and thought.

Be it further resolved that the Local Committee on Arrangements, under the leadership of Harold H. Garretson and Ruskin S. Freer, be commended for the excellence of their contributions to a successful meeting.

Be it further resolved that the Academy expresses its thanks to the Lynchburg Chamber of Commerce for its generous contribution toward the prizes awarded in the Junior Academy of Science.

IN MEMORIAM

Dean Wortley H. Rudd	July 1950
Dean Harry Bear	August 1950
Donald W. Davis	August 1950
Spencer Carter	
Charles W. Johnston	October 1950
Leland Snoddy	November 1950
Dr. Dudley C. Smith	August 1950

President Horsley presented the speaker of the evening, Colonel William S. Stone, Medical Corps, Army Medical Service Graduate School, Washington, D. C., who discussed the medical research in national defense being done by the Army.

In his address, Colonel Stone said the Army's medical research program is centered primarily on the selection, classification, and assignment of manpower from the health viewpoint for its most efficient use during critical periods; mental and physical reactions to stress as they apply in war; and man's adaptation and limitations in use of equipment.

Army researchers, the speaker pointed out, are careful not to duplicate needlessly work being done in civil life or by civilian governmental agencies. Basically, he said, the Army is charged with providing technical information, methods, and material for health practices in national defense that are not available from normal civilian sources. Planning, supervision, and control of Army research projects is done mainly through the National Research Council in the National Academy of Sciences. The researcher himself, however, is not "needlessly restricted," Colonel Stone said.

He pointed to work being done at the Medical College of Virginia in the field of thermal burns and thermal burns complicated by other factors as an example of "how a democratic government can provide support and environment for good research."

As for appropriations, Colonel Stone said "it is our experience that if a budget is made up of worthy projects, the possibility for support by government is as good as or better than that of any individual or private

agency." Support for science from political and administrative levels in the government is effectively secured by keeping congressmen informed on the needs of science, and actively participating in the National Academy of Sciences so its advice to government is competent and science's position is as strong as or stronger than that enjoyed by the academies of science of France, Germany, Great Britain, and other leading nations, Colonel Stone concluded.

After Colonel Stone's talk, the new officers were introduced and installed by President Horsley.

The meeting was adjourned to attend the Civil Defense program in the auditorium of the Main Building. The program for this meeting appears elsewhere in the Proceedings.

FOLEY F. SMITH, *Secretary*

Minutes of Council Meeting

A meeting of the Council on Saturday, May 12, was held in the Faculty Lounge, Lynchburg College, Lynchburg, at 10 A. M. The following were present: President Paul M. Patterson; Ladley Husted, Marcellus Stow, Guy W. Horsley, Allan Gwathmey, John N. Buck, I. G. Foster, and Foley F. Smith. The meeting was called to order by President Patterson. First order of business was to review the recommendations of the Resource-Use Committee, which were approved by the Conference, and properly moved, seconded, and passed, that these recommendations be officially sent to the appropriate State Departments and copy sent to Mr. Alfred Wingo.

The question of the Exchange of Foreign Students Committee was discussed; it was recommended that President-Elect Bird consult with Dr. Fischer on the advisability of continuing the Committee.

The Council expressed their formal thanks to Dr. Guy W. Horsley for his service as President of the Academy.

President Patterson, President-Elect Bird, and Foley F. Smith, were officially designated to attend the meeting of the AAAS in Philadelphia 1950-51, for the Academy Conference.

Formal action was taken by the Council on the recommendation of the Academy Conference, that the present By-Laws concerning the Secretary-Treasurer salary be deleted and the following substituted: "That the Council on recommendation of the Finance Committee, fix the salary of the Secretary-Treasurer annually." Publication of this change in the Proceedings is to constitute notification to the membership as required by the Constitution.

It was recommended that a person be appointed to advise the Local Committee on Arrangements as to the requirements of the Academy at its annual meetings. This person to be continued, if possible, in order that the changing committee on Local Arrangements would have the benefit of past experience. Mr. Edward Harlow and the Secretary-Treasurer were appointed to this post.

The expenses of the Collegiate Steering Committee were authorized to be paid by the Academy to the extent of postage and stationery in order to finance the organization of the committee.

It was recommended for future Council meetings that all Academy Committee personel be discussed at the Fall Council meeting so that the President-Elect can be properly informed for his appointments for the following annual meeting.

It was properly moved, seconded and passed, that the change in By-Laws concerning expenses of the representative of the Virginia Academy to the AAAS meeting be changed, as noted in the Minutes of the Meeting of the Council, May 10. Publication of this change in the

Proceedings to constitute notification to the membership as applied by the Constitution.

It was properly moved, seconded and passed that Section 7 - "Changes in these By-Laws", be changed to read as follows: "These By-Laws may be changed or amended at any meeting of the Council by two-thirds majority vote of those present, subject to approval of the Academy Conference at the annual business meeting."

The reason for this change is to allow the governing body of the Academy, which is the Council, to act in the interim, particularly in cases of emergency, where it would not be advisable to wait for an annual business meeting before action could be taken relative to change in By-Laws, as is now necessary under the present wording of Section 7.

Publication of this proposed change in the Proceedings is to constitute notification to the membership as required by the Constitution.

The question of "Science Fairs" were discussed, and it was decided that the Academy lend its name in support, and in sponsoring of such Fairs in coordination with Science Service, provided that there be no financial obligation on the part of the Academy for such projects.

There being no further business the meeting adjourned at 11:45 A.M.

FOLEY F. SMITH, *Secretary.*

Tabulation of Registration

	Members	*Non-Members*	*Total*
1. Agricultural Sciences	13	6	19
2. Astronomy, Mathematics, and Physics	42	29	71
3. Bacteriology	7	3	10
4. Biology	74	18	92
5. Chemistry	55	20	75
6. Education	5		5
7. Engineering	13	7	20
8. Geology	27	10	37
9. Medical Sciences	22	6	28
10. Psychology	27	9	36
11. Science Teachers	18	3	21
12. Statistics	11	1	12
No Designated Section	15	27	42
TOTAL Senior Academy	329	139	468
TOTAL REGISTRATION			
1950 Roanoke Meeting Registration			782

Minutes of the Council Meeting Charlottesville, June 3, 1951

A meeting of the Council was called by President Patterson, and held in the Alderman Library, University of Virginia, Charlottesville, 3 June 1951.

President Patterson called the meeting to order with the following members present; I. G. Foster, President-Elect Lloyd C. Bird, Horton H. Hobbs, Jr., Mary E. Humphreys, Dean Ivey Lewis, Allan Gwathmey, Clinton Baber, Boyd Harshbarger, Ladley Husted, Marcellus Stow, and Foley F. Smith.

President Patterson announced that Grover Everett, Lynchburg College, had accepted the Chairmanship of the Junior Academy of Science Committee, and that John E. Hocutt, Dean of Men at the College of William and Mary, had accepted the Chairmanship of the Science Talent Search Committee. Mr. Edward Harlow was confirmed as a permanent liason efficer to represent the Academy with all Local Arrangement Committees.

President Patterson presented a letter submitted by John N. Buck whose term as Councillor expires in 1953; stating it was necessary for him to resign because of ill health. The resignation was regretfully accepted; but no action was taken at this time concerning an interim appointment to serve for the balance of his term.

Boyd Harshbarger, Editor-in-Chief gave a report on the policies and the financial condition of the Virginia Journal of Science, and stated that; due to the extremely strict postal regulations, it was necessary that all delinquent members would have to have their remittance accompany their names when reinstated on the subscription list to the Journal. The amount due to the Journal from the Treasurer's last report at the May meeting was turned over to Mr. Harshbarger, balancing all accounts between the Secretary-Treasurer's office, and the Virginia Journal of Science as of this date. It was pointed out that it would be necessary to hold all Committee reports under six hundred words for publication in the Journal, and also that any invited addresses before the Academy need not necessarily be published in full. It was moved, seconded and passed that the Editorial Staff be given authority to publish all, part, or none of the invited papers at the annual meeting; judging them on their scientific value.

It was moved, seconded and passed that the publishing contract for the Journal be renewed with the Commonwealth Publishing Company, of Radford, on the same basis as that of last year.

I. G. Foster and President Patterson, were appointed as a committee

to settle any differences that might arise between the Secretary-Treasurer's office, and the Editorial Staff of the Journal.

A short history of the background of the Academy was given by Dean Ivey Lewis, emphasizing the very important work done by E.C.L. Miller, in founding the Academy and doing the large amount of work entailed for such an organization. He pointed out that there was no one single controlling geographical section in the Academy, but that all members of the various sections should be willing to cooperate with other sections to further the aims and projects of the Academy.

There being no further business the meeting adjourned at 4:30 P.M.

FOLEY F. SMITH, *Secretary.*

Minutes of the Junior Academy of Science Business Meeting

At 3:30 p.m. the Junior Academy held its business meeting in the Lynchburg College auditorium. Education of officers was held at this meeting which was presided over by Billy Graham of Woodrow Wilson Memorial High School of Fishersville. The guest speaker was Professor Harold H. Garretson, who talked on what constitutes a life of science. He illustrated his discussion with examples of scientific endeavor and ingenuity from the life history of a great scientist, Dr. Irving Langmuir.

Minutes of Virginia Junior Academy of Science Banquet

Junior Academy members held their annual banquet at the Dining Room of Westover Hall, Thursday evening.

Dr. Scherer announced the top 15 of the 45 contestants participating in the Science Talent Search, and awarded them certificates. Honorable Mention awards in the interviews were made to the other candidates who were interviewed in Lynchburg. Dr. Scherer pointed out that several scholarships were available to those who participated in the State Talent Search contest and won top ratings.

Dr. Ladley Husted, Chairman of the Miller School of Biology, University of Virginia, delivered the following address.

TRAINING FOR A CAREER IN SCIENTIFIC RESEARCH

A year ago today the members and guests of the Junior Academy of Science, after a series of presentations and announcements such as have been made this evening, were pleased to have Mr. Flory of The Blandy Experimental Farm speak on "Science and Technology." In closing Mr. Flory urged that you "work diligently to acquire a sound foundational basis in all aspects of science and particularly in the science of your choice." These words of sound advice were made on the assumption that the members of the Junior Academy are gentlemen and ladies interested in pursuing a career in science as signified by their presence at the meeting of last year. I shall make no such assumption.

It has come to my attention, during many more years of college teaching than I care to admit, that very few students know what science is, or know if they are interested in pursuing a scientific career. A college teacher so frequently hears the expression—"Science says"— such and such. It is implied that because a vague something referred to as "Science" says it is so, it must be so. Such "faith passeth all understand-

ing." The expression savours of the dark ages when all mankind, or nearly all, bowed down to the word of authority without a qualm of conscience or a spark of reason.

I do not propose to tell you in two syllable words what science is. I shall, however, follow Sherwood Taylor (the author of *Concerning Science*) and adequately define science in as few words as possible. The definition will be unintelligible. I shall urge you to go back to your homes and classrooms and by study and thought put your minds in order, find out what science and the sciences are, and decide if a career in science is of interest to you as it is to me and the majority of the members of the Senior Academy. I anticipate some of you, possibly all of you, will eventually come to some relatively clear understanding of what science and the scientific method are. You may even reach the ethical conclusion that a career in science is what you most desire.

Words change as mankind grows older. The Latin word *scientia* and our word *science* at one time were used to delineate "any kind of expert knowledge." Science today is not so defined. According to Taylor "a well known historian has defined science as 'only another name for the careful and scrupulous use of the human mind.'" This is too broad a definition.

Science has so many essential features that it must be defined in this way: "Science is knowledge obtained by (1) making observations as accurately, definite, relevant and verifiable as possible, (3) recording these intelligibly, (3) classifying them according to the subject being studied, (4) extracting from them by induction general statements (laws) which assert regularities concerning the whole class, (5) deducing other general statements, (6) verifying these statements by further observation, (7) propounding theories which connect and so account for the largest possible number of these laws."

If this definition is unintelligible, find out what science is. When you find yourself saying "Science says"—bear in mind that nothing has even temporarily displaced "Our Father who art in heaven." If the definition discourages you, take heart and be assured that most of the recruits in the large army of scientists today have neither extracted a law by induction nor knowingly propounded a theory.

After you have considered science and the scientific method decide whether you *ought* to aspire to a career in scientific research. Scientific thinking cannot aid you in reaching this conclusion. "The whole of science is derived from: 'A is B, A does B; when X is Y then A is B. It should be obvious that *statements* such as these cannot give rise to the notion of *should* or *ought*."

When you decide, if you do, to enter some field of science you can ask—what kind of training is needed for a career in scientific research? I shall try to tell you what, in my opinion, is the kind of training that such a career demands. This *opinion*—and there are others— is based on some experience and several years of study as a member of the

Liberal Arts Committee of the College of Arts and Sciences of the University of Virginia. You may be aware that colleges and universities are ever trying to improve their methods of teaching, the content of their courses and the variety of courses offered to those who choose to learn. Faculty committees periodically examine the curriculum, or course of study, add requirements, delete others. Often little, sometimes much is accomplished. The Liberal Arts Committee was appointed during a period of curriculum reexamination. It was set up to provide the faculty of the University alternative plans and procedures. For a period of five years it has presented summaries of the courses of study offered at various institutions of higher learning as these courses are changed from year to year.

What kind of basic training does a career in scientific research demand? The answer is—a liberal education. "A liberal education," and I quote from a bulletin of the University of Buffalo, "tends to produce a man who can see each aspect of life in its relation to life as a whole. He has an understanding of the physical world in which he lives. He has learned to base his conclusions on reliable evidence, in restraint of hope, fear, habit, and prejudice. He has a clear and sound conception of what is proper in the relations between man and man, and between the individual and society. He can interpret present phenomena in the light of the past. His vision goes beyond his own time and place; and his emotions have been refined and matured. He can learn from his own experience; but far more important than that, he has acquired the art of learning from the experience of the race as it is recorded in the formulae of the scientist, the hypotheses and conclusions of the historian and the economist, the wisdom of the philosopher, the aspirations and tragedies of the human spirit as they are made clear in the monument of poet, artist, and musician. The liberally educated man has learned to assimilate this knowledge, and make it part of himself—a governing force in his daily life."

Certain aspects of a liberal education should provide the properly endowed student with:

(1) A command of his own language.

(2) A knowledge of the more important foreign languages in which scientific papers are written.

(3) A command of the language of science—arithmetic, algebra, geometry, trigonometry, the calculus, and statistics.

(4) A knowledge of the elements of all the sciences together with a conception of the nature of science in general.

(5) The facts of a particular science chosen as a speciality.

(6) The technique of extracting from the mass of scientific literature the information he wishes to have at his command.

(7) The ability to solve problems, and

(8) Intuitive judgment.

The formal portion of your liberal education has begun. The informal portion will never be completed. I hope many of you will find it possible to attend a college or university where the formal features of a liberal education will be continued, and a brief introduction to a particular specialty can be experienced. I hope some of you, after four years, may enter into "a period of real scientific work under skilled supervision" in a graduate school and after four or five more years will develop the ability to solve problems and the intuitive judgment of great scientists.

I hope each of you who decides he *ought* to enter some field other than scientific research, will keep well in mind that the research workers of the past have "revolutionized man's way of thinking and doing. Because of their achievements, our relations to the world in which we live and to our fellow men have come to depend upon science. . . . Through their discoveries there has been created a civilization which requires scientists for its operation, and each new development demands still more research to solve new problems which are thus created."

I hope all of you will remember, as Bronk has pointed out, "new ideas and concepts are formed within a single mind. Great scientific discoveries will" in the future "be made by *individuals* . . . as surely as will the creations of great music and sculpture and art."

I hope all of you will appreciate and sense the full meaning of a quotation from Louis Pasteur that someday will be inscribed on a Life Science Building at the University of Virginia: "Take interest, I implore you, in those sacred dwellings which one designates by the expressive term laboratories. Demand that they be multiplied, that they be adorned. These are the temples of the future, temples of well being and happiness.. There it is that humanity grows greater, stronger, better."

A social hour followed the banquet, and the program ended at approximately 8:00 P. M. The success of the day's activities was largely the result of the efficient and careful planning of the local arrengements committee. Special thanks are due to Drs. Sibley, Freer, and Garretson for their efforts in carrying out a successful Junior Academy program.

BRYON N. COOPER

Minutes of the Section of Agricultural Sciences [1]

S. F. THORNTON, *Chairman*

E. MAPP DUNTON, JR., *Vice-Chairman*

R. C. CARTER, *Secretary*

T. J. NUGENT, *Section Editor* (1951)

FRIDAY, MAY 11, 1951—9:30 A. M.—ROOM 15, MAIN BUILDING

1. An Attempt to Control Growth in a Willow Oak (*Quercus phellos*) Hedge With Maleic Hydrazide.

W. S. Flory, Jr.; *The Blandy Experimental Farm, University of Virginia, Boyce.*

Some advantages of *Quercus phellos* as an ornamental for the southeastern states are pointed out. Plants of this species make an excellent, and beautiful hedge. Like most woody hedges, however, it is laborious to prune and keep in formal shape. Maleic hydrazide sprays were used in 1950 in an effort to inhibit growth and reduce the amount of pruning required. Sprays with concentrations of the active maleic hydrazide ingredient of approximately .125%, .25% and .375% were used. (These were made up by using about three pounds, six pounds, and nine pounds, respectively, of the diethanolamine salt per 100 gallons of spray.) No apparent differences were noted in rate of growth from sprayed and unsprayed portions of the hedge, following any of the spray applications. This species may be resistant to foliage sprays of maleic hydrazide, as White found to be true with apples and cherries; or higher concentrations of the chemical than those usually used may be required to inhibit growth of oaks.

2. Preservation of Color and Flavor in Grated Horseradish

Lyle L. Davis; *Virginia Agricultural Experiment Station, Blacksburg.*

Grated horseradish exposed to light and air turns amber to brown in color, becomes soft and mushy, loses typical flavor and aroma, and ultimately develops an objectionable odor. Commercial manufacturers know that the shelf life does not ordinarily exceed three weeks.

A concentration of 0.05% potassium metabisulfite in grated horseradish is as effective in preventing loss of color, when stored at 70-75°F., as 0.10 and 0.15% potassium metabisulfite; however, an increase of concentration to 0.20% will decrease color change.

At room temperature, a concentration of 0.05% potassium metabisulfite will prolong the shelf life of horseradish to at least six weeks.

A concentration of 0.20% potassium metabisulfite in horseradish will permit storage for as much as six weeks with only a little change in color and flavor.

3. Pine Mouse Control by Ground Sprays.

Frank Horsfall, Jr.; *Virginia Agricultural Experiment Station, Blacksburg.*

Aldrin, dieldrin, and parathion were employed as rodenticides against pine mice in apple orchard ground floor sprays. Parathion, used ineffectively at 3.6 lbs. of 100% product per acre, appeared to repel mice and to force them to live underground for a week to ten days, with probable increased hazard to trees. The evidence tends to alleviate fears that parathion might be destructive to wild life in contiguous tracts surrounding orchards receiving insecticidal sprays. Pine mice practically disappeared from one small plot and an isolated orchard given uniform complete coverage of the orchard floor at the rate of four pounds of actual dieldrin per acre. Some replicated small plot results with both dieldrin and aldrin were inconclusive because the protective border strips were insufficient in width.

4. Some Aspects of Insect Control.

R. N. Hofmaster: *Virginia Truck Experiment Station, Norfolk.*

Normally, nature remains more or less in a state of equilibrium. When anything upsets this "balance of nature", a relatively minor group may increase to a position of major dominance. Insect outbreaks are an example of this phenomenon. Unfortunately, many of our newer insecticides, being nonselective, kill beneficial as well as harmful species. As a result, we are now confronted with new and severe insect problems. The use of systemic insecticides and the possibility of controlling insects through altering their nutritional requirements are two developments that may prove very effective. Inasmuch as the systemics are absorbed by the plant and are translocated to various parts, good coverage and weathering are of secondary importance. There are definite indications that changing the diet of certain insects will lower their reproductive potential; e.g., the chinch bug has been shown to be allergic to high levels of nitrogen.

5. Sprays for Control of the Oriental Fruit Moth.

Marvin L. Bobb; *Virginia Agricultural Experiment Station, Charlottesville.*

The following insecticides were tested during 1949 and 1950 as sprays for the control of the oriental fruit moth: chlordan, dieldrin, aldrin, benzene hexachloride, methoxychlor, lead arsenate, E P N 300, DDT, and parathion. Only the last three were effective in controlling this pest.

Data indicate that one spray application applied at the peak of moth flight for control of the first and second broods of the oriental fruit moth is more effective than similar sprays applied for control of the second and third broods, and equally as effective as sprays applied for control of the first, second, and third broods.

6. Corn Earworm Control and Biological Factors Influencing It.

Douglas E. Greenwood; *Virginia Truck Experiment Station, Norfolk.*

The corn earworm can be controlled satisfactorily over much of its range by dusts and non-oil sprays. Corn-producing areas, for the most part, are designated as lightly or heavily infested depending on whether

they support moderate earworm populations which respond to normal control practices, or populations which are so affected by biological factors that special control measures are required. The more heavily infested areas are infested early, remaining so throughout most of the season with little tendency toward "worm-free" periods, and oviposition occurs in such an indiscriminate manner that complete infestation is likely to occur before any control measures can be started. Oil-DDT emulsion sprays have given excellent control, experimentally, and appear to be capable of rendering ineffective many of the biological peculiarities which have existed heretofore.

7. Preliminary Trials of Methods of Planting and Fertilizing Corn Growing with Ladino Clover.

Russell K. Stivers; *Virginia Agricultural Experiment Station, Blacksburg.*

Corn was interplanted in an existing stand of ladino clover. Four spacing methods and two levels of nitrogen were used in a split plot type experiment on Groseclose silt loam. The same number of corn plants per acre was used in all treatments.

Insect damage made replanting necessary. This damage was approximately the same in all treatments.

When corn in 40-inch rows was grown adjacent to ladino clover, there was a competition for nutrients, as shown by a trend toward lower yields and more nitrogen deficiency symptoms on corn.

After one year, ladino clover still had not grown over an average distance of 6 inches across a 40 inch row where corn had been grown.

Different methods of spacing corn in an existing stand of ladino clover resulted in significant differences in yield and weight per ear of corn in this experiment.

Results of more years of testing are needed to draw conclusions.

8. Nitrogen—Soil Moisture Relationships in a Grape Vineyard.

Wesley P. Judkins; *Virginia Polytechnic Institute, Blacksburg.*

9. The Influence of Certain Fertilizing Materials, Particularly Nitrogen Carriers, on the Soil Reaction in the Potato Row during the Growing Season.

E. M. Dunton, Jr., R. B. Hall and M. E. Taylor; *Virginia Truck Experiment Station, Norfolk.*

In 1948 work was conducted to determine the influence of acid, neutral, and basic fertilizers on soil reaction and nutrient level in the potato row during the growing season. A marked variation in soil pH was found at different sampling locations. The work, conducted in 1949 and 1950 and reported in this presentation, is a follow-up of the 1948 work. The purpose of this second experiment was to check the influence of different fertilizer mixtures on the pH and nutrient level at various locations with respect to the fertilizer bands and at certain intervals after planting. Samples were taken at seven different locations in the potato row, two, four, eight and twelve weeks after planting.

As in 1948 the fertilizer mixtures had a marked and varied influence on the soil reaction and nutrient level at the different sampling locations, and only in the sample taken in the fertilizer bands were there differences in the soil reaction for the different fertilizer mixtures.

10. Management of Grass Leys to Lengthen the Grazing Season and Improve the Herbage Quality.

R. E. Blaser, Willis Skrdla, and T. Taylor; *Virginia Agricultural Experiment Station, Blacksburg and Middlesburg* (presented by title)

11. The Effect of Continuous Pasture on the Distribution of Organic Matter in the Profile of the Native Forest Soil.

F. N. Goforth, H. F. Huckle, and S. S. Obenshain; *Virginia Agricultural Experiment Station, Blacksburg.*

A study was made to determine the effect of continued pasture on the distribution of organic matter in the upper profile of a native forest soil. Samplings of soils were taken at 10 randomized locations in a plot under native hardwood forest and in an area of the same soil 100 yards away which had been in permanent pasture for over 40 years. Soil samples were taken at five depths: 0 to 2 inches, 2 to 4 inches, 4 to 6 inches, 6 to 8 inches and 8 to 10 inches. Organic matter was determined by the wet combustion method on each of the 10 samples for each depth. The analysis of variance showed no significant difference between the organic matter content in the 0 to 2 inch layer between soil in forest and permanent pasture. In the other four layers there was a significant difference between organic matter content of the soil under forest and permanent pasture. With increase in depth, these differences became greater, with larger amounts of organic matter in the soil under permanent pasture.

12. The Activities of the Virginia Department of Agriculture.

Parke C. Brinkley; *Virginia Department of Agriculture, Richmond.*

The Department, with 240 regular and 300 part-time employees, is primarily a service and regulatory agency, spending 1.5 million dollars annually, enforcing 49 laws, divided into 6 divisions, with principal work as follows:

Administrative: Supervises apple and peach inspection; operates two lime grinding plants which supply lime for farmers; and performs miscellaneous administrative operations.

Animal: Controls and eradicates diseases among animals; inspects livestock auction markets; and supervises interstate movements of livestock and poultry.

Chemistry: Services other divisions; performs extensive laboratory work; and enforces fertilizer, insecticide, fungicide, rodenticide, paint, gasoline and lime laws.

Dairy and Food: Enforces laws relating to dairy products and food and feed industries.

Markets: Works for improvement in distribution and handling of food and farm products; and enforces weights and measures requirements.

Plant: Is engaged in seed control, plant pest quarantine and control, and apiary work.

13. Plant Quarantines for the Control of Insects and Plant Diseases.

G. T. French; *Virginia Department of Agriculture, Richmond.*

Although plant quarantines have been used by Federal and State agencies as a means of controlling insects and plant diseases for more than half a century, scientists and others are not in agreement as to their effectiveness.

The Plant Quarantine Act of 1912 served as the foundation for the protection of this country from foreign pests by the Federal government. In addition to this act, the Federal government regulates by domestic quarantine and interstate movement of pests not generally established.

The several states enforce many quarantines which are drawn up to prevent intra- as well as interstate movement of plant pests.

Pests are being held in check by these quarantines. As a result of these quarantines several pests have been eradicated from infested states or parts of states; other quarantines have failed to prevent spread of both insects and diseases and have been revoked.

Quarantines should be biologically sound and follow principles adopted by the National Plant Board. Research is basic for quarantine action, and if followed, the evidence seems to justify its utilization by both Federal and State agencies.

14. The Necessity, Provisions and Purpose of Hybrid Corn Legislation Passed by the 1950 Virginia General Assembly.

J. W. Midyette, Jr.; *Virginia Department of Agriculture, Richmond.*

Much work, time and thought have gone into the development and advancement of the hybrid corn program, and in most cases these efforts have proved to be of great value to the farmer. The increase in acreages of hybrid corn, obtained as a result of such efforts, presented a serious problem. Tests, surveys, and reports indicated that hybrid seed corn was being misbranded and improperly produced. In order to protect the farmer and to preserve the work of hybrid corn research men, legislation was written and passed, authorizing the Department of Agriculture:

1. To require registration of all pedigrees and of all fields planted for the production of hybrid corn.
2. To make field inspections of hybrid double crosses grown for the production of hybrid corn.
3. To stop sale on seed which are not produced under controlled conditions.
4. To make field tests of corn sampled on the open market and to stop sale of such corn when it is not genetically pure.
5. To require samples for testing and also the descriptions of inbreds and single crosses used in each particular hybrid.
6. To require that all open pedigree hybrids be certified.

The purpose of this legislation, which goes into effect January 1, 1952 is to assure farmers and legitimate seed producers the greatest protection possible. The restrictions placed on hybrid seed corn producers are designed to require by law the practices necessary for the production of seed which is genetically pure.

15. Brucellosis in Domestic Animals.

W. L. Bendix; *Virginia Department of Agriculture, Richmond.*

Since the isolation by Bruce in 1887 of a specific organism causing Malta fever, tremendous progress has been made in the study of *Brucella* infection in man and animals. Three types have been identified; *Brucella melitensis*, affecting goats primarily, *B. abortus*, affecting cattle primarily, and B. *suis*, affecting swine primarily. All types may attack other hosts, however, and indeed, man is susceptible to all three.

The disease in animals is principally an involvement of the reproductive organs, and is spread by means of infective uterine discharges, which may be taken in by way of contaminated water or feed, by splashing into the conjunctival sac or by passage through the abraded skin. Once an animal contracts the disease, it remains a carrier.

Diagnosis is made most often by means of the blood agglutination test, a 1:100 or higher reaction being considered evidence of true infection. Special tests of milk have also been devised. But the most accurate means of diagnosis is to isolate the organism by special laboratory methods, with or without the aid of guinea pig inoculation.

The organism is quickly destroyed by direct sunlight, and by the common disinfectants. Where infective material remains in a cool, protected place, however, *Brucella* remain viable for months, an important factor in its control on farms.

Since man contracts brucellosis by direct or indirect contact with infected animals, this disease is a major problem demanding the joint efforts of the veterinary and medical professions.

16. Differences in Nutritional Requirements Observed in Inbred Lines of Poultry. I. Manganese.

Clayton E. Holmes and James H. Bywaters; *Virginia Agricultural Experiment Station, Blacksburg.*

When 25 milligrams of manganese per pound of ration, the level suggested by the National Research Council, was fed to chicks in our breeding project, a considerable amount of perosis developed. The incidence and severity of perosis varied by breeds and in different inbred lines in a breed. In this study, four inbred lines of New Hampshire chicks receiving the same amounts of choline, biotin, and phosphorus were fed three levels of maganese (15.8, 25, and 50 milligrams per pound of ration). All were reared for ten weeks in battery brooders.

With 15.8 milligrams of manganese the percentages of perosis in males were 75, 54.5, 25, and 16.2, and in females 16.2, 12.5, 7.1, and 0 respectively for lines 1 to 4. With 25 milligrams, perosis in male chicks was 28.5, 16.2, 9.0, and 8.5 for lines 1 to 4; there was no perosis in females. With 50 milligrams, in males the percentages were 30.7, 14.2, 6.6, and 0 for lines 1 to 4; and again there was no perosis in females.

17. Organic Mercury as Fungicides.

R. H. Hurt; *Virginia Agricultural Experiment Station, Charlottesville.*

Organic mercury compositions are divided into two classes, namely, compounds in which one valence of the mercury is satisfied by an organic radical and those in which both valences are bonded to organic radicals.

The fungicidal value and toxicity of these compounds depend largely on the nature and size of the organic radical to which the mercury is bonded.

The organic mercuries are fungicide eradicants rather than protective fungicides. The organic materials which have shown the greatest promise as eradicant fungicides are the phenylmercuric salts, pyridylmercuric salts, and the mercurated polyethyl esters of phosphoric acid. All of the organic mercury compositions herein mentioned are very effective eradicants for the apple scab fungus. The organic mercury salts are affected by light and their fungicidal effectiveness is of short duration.

18. The White Potato Breeding Program in Eastern Virginia and the Technique Used in Developing New Varieties.

M. M. Parker; *Virginia Truck Experiment Station, Norfolk.*

The objectives of the potato breeding program in eastern Virginia are an improvement in horticultural characters, such as yield and market quality, and resistance to some of the more serious potato diseases.

Since the potato is a very heterogeneous species in many of its characters, sexual breeding is recognized as the most promising method of combining the desired characteristics in a new variety. To get the best results, however, the breeder should be familiar both with the characteristics of the varieties to be crossed and also with the characteristics of the varieties' wild ancestors.

The crosses usually exhibit hybrid vigor, and since all generations thereafter are multiplied vegetatively they should retain both this vigor and all inherited characteristics.

Results indicate that seedlings which produce tubers of irregular shape should be discarded at the first generation. In the second generation undesirable characters such as low yielding ability, undesirable shape, deep eyes, and susceptibility to disease may be discarded. Thereafter, all promising seedling should undergo several years' tests in order to determine their full value.

19. Effect of Environment on Some Genetic Characters in Horticultural Crops.

W. S. Flory, Jr.; *The Blandy Experimental Farm, University of Virginia, Boyce.*

Several environmental responses exhibited with respect to certain genetic characters are pointed out. Experimental data presented show the resulting effects on head shape of All Head Select cabbage, from growing the same selected lines at five different geographical locations. The two most distant locations (Weslaco, Texas and Madison, Wisconsin) are approximately 17° of latitude apart. A total of 28 different lines were grown; of these, 15 were grown at each of the five stations. An average length/width (L/W) head index for all lines at each location increased from .89 and .92 (Wisconsin), through .97 (Mississippi) to .99 and 1.08 (Texas), indicating a trend from flat through round to elongated heads as locations changed from higher to lower latitudes. This same trend was apparent when most lines were compared individually at the several locations. Three or four lines, however, had a very small "spread" in L/W head ratios at the different locations. When producing heads of the desired shape and size, these more "stable" lines are probably the more desirable ones to increase for commercial production in different areas.

Possible environmental and genetical considerations affecting the results are discussed. Previously published results secured when growing Marion Market cabbage at three different locations (Flory and Walker, 1939) are mentioned.

20. The Influence of Moisture Content of Corn on the Dosage Requirements of Three Recommended Farm Grain Fumigants.

J. O. Rowell; *Virginia Agricultural Extension Service, Blacksburg.*
(Presented by title.)

21. Relation of Root Growth to Yield of Bush Lima Beans and Sweet Corn.

Flood S. Andrews; *Virginia Agricultural Experiment Station.*
(Presented by title.)

Minutes of the Section of Astronomy, Mathematics, and Physics [2]

A. MARGUERITE RISLEY, *Chairman*
REUBEN E. ALLEY, JR., *Secretary*
I. G. FOSTER, *Section Editor* (1951)

FRIDAY MAY 11, 1951 — 9:30 A. M. — ROOM 21, MAIN BUILDING

1. Bell Design of Brass Musical Instruments.

Clyde E. Miller; *Lynchburg College.*

The family of brass musical instruments is the group known as the horns and includes the trumpet, cornet, French horn, trombone, and bass horn. The most prominent feature of these instruments is the bell, and this section is important because of its effect on intonation. Bell designs have undergone radical changes as the instruments developed, but for the last century have been virtually static. The final designs were as nearly perfect as the trial and error method of the craftsmen would allow but have never been justified theoretically. This investigation deals particularly with bell taper of modern instruments and the feasibility of approximating bell curves by simple mathematical curves. The bell of a modern trumpet was selected as the basis for study and its dimensions were considered as observed points in a statistical investigation. Mathematical curves were fitted to these points by the methods of least squares and moments. Among others, curves representing functions of the following types were investigated: the cone, exponential, hyperbola, parabola, power function, and catenoidal. Of these, only the hyperbola provided a close fit and the best such curve as determined by the method of moments is presented as a possible replacement for the bell now used. Some empirical computations are made on the expected performance of suggested bells, and the prediction made is that the bells should be the equal or superior of present designs.

2. The Eigenvalues of the Harmonic Oscillators.

E. J. McShane; *University of Virginia.*

For a harmonic oscillator of mass m and attracting force such that the period in the classical theory would be ω, the Hamiltonian is $(p^2 + m^2\omega^2q^2)/2m$. The corresponding operator H in the quantum theory is given by $H = (-h^2/m)d^2_D/dq^2 + (m\omega^2/2)q^2_D$. Dirac has shown that if we assume that this operator has a pure point spectrum, it can be shown directly from the properties of the operators d/dq and q, without recourse to solving differential equations, that the spectrum consists of the points $(2n + 1)h\omega/4\pi, n = 0,1,2, \ldots$. However, Dirac does not show that the assumption of a pure point spectrum is justified, so his conclusion is merely that either H has a continuous spectrum or else its spectrum consists of the points named above. In this communication it is shown that by using general theorems on the spectra of self-adjoint operators, it can be proved that H has no continuous spectrum and that its spectrum consists of the sequence of points named above.

3. A High Temperature, High Precision Automatic Controller.

L. A. Cosby, and J. F. Ryman; *Virginia Military Institute* and *Virginia Polytechnic Institute.*

A description is given of an automatic temperature regulator which supplies a correction to the furnace power in proportion to the deviation from the control point. The controller consists of a multi-stage magnetic amplifier which is used to amplify the difference between a control point signal and the thermoelectric output of a base-metal couple and other auxiliary components. Results indicate that the controller is capable of maintaining the controlled area to within 5°C. in the range of temperatures up to 1200° C. The controller is thought to be unique in that it contains no electronic or mechanical devices while it retains the advantages of sensitivity and ruggedness.

4. An Interpretation of Peculiar Motions in Terms of Galactic Structure.

A. N. Vyssotsky; *Leander McCormick Observatory, University of Virginia.*

The similarity between our galaxy and some external galaxies suggests that indications of spiral structure may be found in our system. The deviation of the principal vertex of the peculiar motions of nearby stars with small orbital inclinations is a local phenomenon which may be explained by postulating an elongated stellar cloud similar to a spiral arm. This cloud would extend from the fourth to the second quadrants in the galactic plane when the x-axis is towards the direction of galactic rotation, i.e. the rotation of the galaxy is in the sense that the "arm" is trailing.

5. The Astrometric Orbit of the Spectroscopic Binary Chi Draconis.

W. E. Mitchell, Jr.; *Leander McCormick Observatory, University of Virginia.*

Chi Draconis ($\alpha = 18^h22^m$, $\delta = 72°43'$) is a nearby, bright, single-line spectroscopic binary with a short period (281^d), large eccentricity ($e = 0.45$), and large $a\sin i$ ($61.8 \pm 0.5 \times 10^6$km).

Its apparent orbit has been derived from the measurement, in right ascension and declination, of 74 plates taken with the McCormick 26-inch refractor and covering the years 1946 to 1950. It was found that the system has a parallax of 0."145 and a semi-major axis of $73.2 \pm 8.2 \times 10^6$km. The orbit has an inclination of $71° \pm 2°$. The astrometric $a\sin i$ is then $69.2 \pm 7.8 \times 10^6$km, a value well within the probable error of its difference from the spectroscopic $a\sin i$.

From our investigation we have concluded that the 'invisible' companion has a mass about ⅔ that of the primary and a brightness at least 1 and ⅓ magnitudes fainter. The effect of various degrees of blending is discussed.

6. On Orthogonal Transformation of Velocity and Acceleration.

H. Y. Loh; *Virginia Polytechnic Institute.* (Presented by title.)

7. The Circumradius of a Spherical Triangle.

B. Z. Linfield; *University of Virginia.*

If R is the circumradius of a spherical triangle ABC, there is a well-known formula for cot R in terms of A,B,C and S. If only the sides

a,b,c are given we can get a formula for tan R in terms of a,b,c by the use of the vector equation $tN = (u \times x + v \times w + w \times u) \cos R$, where u, v, w are the vector coordinates of the vertices of this spherical triangle (radius of sphere being one, and center at the origin), N that of the circumcenter, and

$$t = |u,v,w,| = (u \times v) \bullet w = \begin{vmatrix} 1 & \cos c & \cos b \\ \cos c & 1 & \cos a \\ \cos b & \cos a & 1 \end{vmatrix}^{\frac{1}{2}} > 0$$

For, taking the magnitude of each side and simplifying, yields

$$\tan R = \frac{4}{t} \sin \frac{a}{2} \sin \frac{b}{2} \sin \frac{c}{2}$$

The last equation is equivalent to

$$t = -\frac{4}{\sec S} \frac{\cos (s - A)}{\sin A} \frac{\cos (S - B) \cos (S - C)}{\sin B \qquad \sin C}$$

and could have been derived from

$$\cos A = \frac{\cos a - \cos b \cos c}{\sin b \sin c}, \sin A \sin b \sin C = t$$

8. Temperature Effects on Minimum Spark Ignition Energy.

C. A. Gregory, Jr. and I. R. King; *Experiment Incorporated.*
(Presented by title.)

9. Comparison of the Computed and Experimental Efficiency of a Scintillation Counter for Neutrons.

K. B. Rhodes, J. H. Neiler, and G. E. Owen; *University of Pittsburgh.*

An integral bias study was made of the radiations, gamma rays plus neutrons, from a standardized Po-Be Source. The neutron counting rates were obtained by Pb absorption techniques. Using a published energy distribution of the neutrons from a Po-Be source, we computed the expected counting rate for the scintillation counter. The computed efficiency was based upon an analysis of the hydrogen content of the anthracene crystals and upon the theoretical cones of exclusion which arose from the presence of the pulse discriminator. The comparison of the computed and experimental counting rates shows reasonable agreement. In conclusion, these experiments suggest that scintillation counters can provide an efficient method of determining the intensity of a fast neutron radiation.

10. Photoelectric Photometry at the Leander McCormick Observatory.

E. R. Dyer, Jr.; *Leander McCormick Observatory, University of Virginia.*

The chief photometric program at the Leander McCormick Observatory consists of the transfer of the international stellar standards for magnitude and color from the North Polar Sequence to the Harvard C Regions where they will be accessible to Southern hemisphere observers. The photoelectric photometer and amplifier (v. the following paper by Mr. Donald Nieman) provide a linear scale of intensities, and Corning blue and yellow filters furnish a consistent color system. The zero-point of the magnitude scale will be transferred photographically by a large number of equal-altitude polar comparisons. The optics of the photo-

meter, its sensitivity, and observational means of eliminating the sky background and the dark currents are described, and a few preliminary results reported.

11. **Instrumentation for Photoelectric Photometry.**
Donald F. Nieman; *Charlottesville.*

The new D. C. amplifier for the photoelectric photometer of the McCormick Observatory is described in detail. A special emphasis is put on the techniques for reducing the leakage currents. These leaks were cut from 10^{-7} to 10^{-11} amperes. The paper will appear in full in the VIRGINIA JOURNAL OF SCIENCE.

12. **Transmission Line Electro-Optical Shutter.**
H. S. Morton and J. W. Beams; *University of Virginia.* (Presented by title.)

13. **A New High Constant Speed Rotating Mirror.**
J. M. Watkins and J. W. Beams; *University of Virginia.* (Presented by title.)

14. **A Magnetically Suspended Equilibrium Ultracentrifuge.**
A. Robeson, J. D. Ross, and J. W. Beams; *University of Virginia.* (Presented by title.)

15. **Resolution of Cosmic Ray Components with Low Pressure Geiger Counters.**
P. A. Morris; *University of Virginia.* (Presented by title.)

16. **The Azimuthal Distribution of Photo-electrons Produced by Polarized Photons.**
F. L. Hereford; *University of Virginia.* (Presented by title.)

BUSINESS SESSION

Officers elected for 1951-52 were as follows: B. Z. Linfield, Mathematics, University of Virginia, Chairman; S. M. Heflin, Physics, Virginia Military Institute, Secretary; I. G. Foster, Physics, Virginia Military Institute, Section Editor for VIRGINIA JOURNAL OF SCIENCE for a term of five years.

17. **Papers by Three "Honorable Mention" Winners in the National Science Talent Search Contest.**

A Formula for Calculating the Resultant of Two or More Sine Waves of the Same Frequency.
Bayne Bentley; *Jefferson High School, Roanoke.*

The Development of the Cloud Chamber.
Richard Lyon; *Washington Lee High School, Arlington.*

An Elementary Research in Fluoresence, Phosphoresence, and Luminesence.
Billy Graham; *Wilson Memorial High School, Fishersville.*

Minutes of the Section of Bacteriology [3]

J. DOUGLAS REID, *Chairman*
W. A. DORSEY, *Vice-Chairman*
W. FRENCH SKINNER, *Secretary*
J. DOUGLAS REID, *Section Editor* (1951)

FRIDAY, MAY 11, 1951 — 9:30 A. M. — SMALL BIOLOGY LABORATORY, BIOLOGY BUILDING

1. Activities of Soil Microorganisms as They Influence Availability of Plant Food in Soils Subjected to Stubble Mulch Tillage Practices.

   S. J. R. Gamble, Fred S. Orcutt, and T. W. Edminster; *Virginia Polytechnic Institute.*

The idea of using the previous crop residues (stubble mulch) for the open cultivated crop in the normal rotation has proved quite effective in reducing erosion losses. Laboratory studies of stubble mulch practices on Virginia soil at Virginia Polytechnic Institute have shown there is definite difference in plant food availability in the soil throughout the season as a result of the mulching treatments. To determine whether or not the microflora were involved as a possible factor in the plant food availability, comparative data were obtained from stubble mulch and turnplow soil samples. Biochemical nitrification rates as determined with the perfusion apparatus of Lees and Quastel showed lower amounts of nitrate-nitrogen from the stubble mulch samples. A lowered nitrification rate of the stubble mulch sample might result in a temporary nitrate deficiency in the open cultivated crop where this type of tillage is practiced.

2. The Production of Enterotoxin by Staphylococci Recovered from the Bovine Mammary Gland.

   W. B. Bell and M. O. Veliz; *Virginia Agricultural Experiment Station, Virginia Polytechnic Institute.*

3. Incidence of Canine Leptospirosis in Detroit, Michigan.

   L. Lee Kupferberg; *University of Virginia School of Medicine.*

Blood samples were obtained from fifty dogs in the custody of veterinarians located in various sections of the city. The sera were examined by means of the dark-field microscopic agglutination test, using four to seven-day old living cultures of *Leptospira icterohaemmorhagiae* and *L. canicola* as antigen. The agglutination-lysis test of Schuffner and Mochtar (with the modified technique for reading rapid slide agglutination of *Leptospira* as used by Minette) was employed in reading the titers. The results of this study indicated that sera from 38% of the dogs examined had agglutinins for *Leptospira.* Fifty dogs were examined, three (6%) reacted to the classical strain and sixteen (32%) reacted to the canicola strain. Of the sera from twenty-nine males tested, 55.2% gave positive agglutination reactions. Fourteen and three-tenths per cent of the twenty-one sera collected from females gave positive agglutination reactions. Suggestions were made for the eradication of the disease.

4. Extract Medium Cultivation Studies on *Endamoeba histolytica.*

E. Clifford Nelson; *Medical College of Virginia.*

Extract medium is composed of an alcohol, chloroform, ether or acetone extract of egg yolk or liver, an agar base, phosphate saline overlay, and rice powder. This medium, in combination with a bacterial population, meets the growth requirements of *E. histolytica.* In a series of studies on the role of various components, the agar has proved to be an essential constituent. This finding offers a new approach to the study of the growth requirements of the ameba.

5. Proteolytic Activity of Crude Extracts of *Lactobacillus casei.*

Leon Gonshery and P. Arne Hansen; *University of Maryland.*

Cell-free extracts of *Lactobacillus casei* (strain #318 U.S.D.A.) have been prepared by shaking suspensions of the organism with very small glass pavement marking beads, in the Mickle Tissue Disintegrator. The degree of disintegration was ascertained by the electron microscope. After a suitable time of shaking, only some empty disrupted cell walls remained in a matrix of extruded cell material debris. After centrifugation, the extracts were examined for proteolytic activity.

It was found that the crude extracts were active against casein, gelatin, trypticase, tryptone, Bacto peptone, dl-leucylglycylglycine, glycyl-l-leucine, and dl-alanylglycine. No activity of the extracts against d-leucyl-l-tyrosine and chloracetyl-l-tyrosine could be measured. The results obtained using such extracts indicate the presence of proteinase, aminopolypeptidase, and dipeptidase, but the absence of carboxypolypeptidase.

6. A Study of the Comparative Activity of Five Antibiotics Alone and in Certain Combinations Against *Escherichia coli, Aerobacter aerogenes, Pseudomonas aeruginosa* and *Proteus sp.*

J. Douglas Reid, Muriel M. Jones and Evelyn C. Bryce; *Medical College of Virginia.*

Aureomycin, chloromycetin, penicillin, streptomycin and terramycin were tested against *E. coli, A. aerogenes, Ps. aeruginosa* and *Proteus sp.* using the tube dilution method. All of the antibiotics were compared on a weight basis. The most effective antibiotics by in vitro test against the first three microorganisms mentioned, were aureomycin, chloromycetin and terramycin. Penicillin, chloromycetin and streptomycin were most effective against *Proteus sp.*, in that order. When various combinations of these antibotics were tested against the four species, an additive effect, and in certain instances a synergistic effect, was noted. No two antibiotics appeared to be superior in bringing about this effect, nor did it occur more frequently against one species than another.

7. Yeast Extract as an Important Aid in Culturing Bacteria on Common Media as Evidenced by Respiration Rate and Extent of Growth.

Fred S. Orcutt, Kendall W. King, and W. R. Stafford; *Virginia Polytechnic Institute.*

By the use of Warburg techniques, relatively high concentrations (1-2%) of yeast extract has been found to stimulate the respiration rate of washed suspensions of *Bacillus subtilis* Koch-Novy three to tenfold. The active component is thermostable, unaffected by Norit and charcoal

filters, partly soluble in ethanol but not in acetone, only partially inactivated by boiling at pH's of 9 and 2.7, and destroyed by phosphotungstate and lead acetate treatment.

Since the "resting cell technique" was used, cell proliferation could not be the cause of the greatly increased rate of respiration. Lower concentrations of yeast extract that are usually used to furnish accessory growth substances did not produce this increased rate. The amount of oxygen absorbed by cells in the presence of yeast extract far exceeded the theoretical amount of oxygen absorbed by the cells for a given amount of glucose. This indicates the presence of substances in the extract which serve as substrates for respiration.

Yeast extract is an important aid in culturing bacteria on common stock media. Many organisms which tend to be fastidious on common media show a marked increase in the rate and extent of growth by the addition of 2% yeast extract.

8. Adenosine-5-phosphate in Cysteine metabolism by *E. coli* and *P. vulgaris*.

L. Lee Kupferberg and J. Oliver Lampen; *Western Reserve University, Cleveland, Ohio.*

E. coli and *P. vulgaris* were grown anaerobically in media containing one per cent cystine. Cell-free extracts were prepared by grinding the cells with alumina and extracting the enzyme, cysteine desulfhydrase, with M/10 phosphate buffer, pH 7.4. The enzyme preparation obtained from *E. coli* was capable of degrading cysteine to pyruvate, H_2S, and NH_3. This enzymatic activity was lost after a period of seventy-two hours even though the enzyme preparation was stored at -10° C. Cell-free extracts of *P. vulgaris* tested for enzymatic activity immediately after preparation were inactive. Activity of the cell-free extract of *P. vulgaris* was restored when the extract was combined with the alumina in which the intact cells were ground. Activity could be restored to the inactive enzyme preparations of *E. coli* and *P. vulgaris* by the addition of their boiled juices. Subsequent experiments showed that addition of adenosine-5-phosphate restored activity. In view of Kallio's finding that the activity destroyed by "aging" cells at pH 4.5 for one hour could not be regained by the addition of adenosine-5-PO_4, it is possible that more than one co-factor is involved in the action of cysteine desulfhydrase on cysteine.

9. Microbiological Synthesis of Riboflavin to Enrich Swine Viscera Used for Poultry and Livestock Feed.

V. Frank Boyd Jr., Fred W. Tyléc, and Fred S. Orcutt; *Virginia Polytechnic Institute.*

Eighteen unknown organisms isolated from swine viscera and eleven organisms known to be capable of riboflavin production on various media were investigated as to their ability to synthesize riboflavin on a simple medium of tankage and distilled water. Using the microbiological assay technique, one of the unknown organisms, #6, (believed to be an *Achromobacter* sp. or a *Shigella* sp.) was found to be the most significant producer. On further investigation of the B_2 synthesis of organism #6 the following facts were noted:

Maximum B_2 synthesis was obtained in the pH range 7.5 to 8.0, by using mechanical agitation and a relatively high ratio of surface area to volume over a period of ten days. It was found that B_2 content of the tankage could be increased from 3.5 mcg. to 49.3 mcg. per gram dry weight. Since dried skim milk has a content of 19 mcg. and is considered

an excellent source of B_2, it is concluded that the microbiological synthesis of riboflavin is a possible means of enriching the B_2 content of tankage sufficiently to raise its competitilve standing as a protein supplement for poultry and livestock feed.

10. Oxygen Uptake of Mycobacteria.

Medhat A. Hussein, P. Arne Hansen, and Norman C. Laffer: *University of Maryland.*

The respiratory metabolism of *Mycobacterium phlei, Mycobacterium avium, Mycobacterium paratuberculosis* and *Mycobacterium tuberculosis* B.C.G. was studied.

The rate of respiration was increased by adding Tween-80 while the same low concentrations (0.005-0.300%) of Triton-A-20 showed no effect.

As a substrate, sodium lactate produced the highest rate of oxygen consumption with all strains. Glycerol and glucose were respired at a slower rate, but these two substrates did not increase the respiration of *B.C.G.*

Neither benzoate nor salicylate affected lactate respiration of any of the strains. Para-aminosalicylate inhibited lacetate respiration of all strains. Para-aminobenzoate (M/200) did not influence lactate respiration of *B.C.G.* or *M. phlei*; but it inhibited the pathogenic species.

Cyanide inhibited the respiration of glucose, glycerol and lactate by all strains. With the exception of *M. paratuberculosis*, mono-iodoacetate (M/500) did not affect the respiration of lactate. It inhibited the respiration of glycerol and of glucose by all stranis respiring these two substrates.

In all cases where inhibition occurred, the cells recovered completely or partially after ten to twenty minutes. It is indicated that at least with cyanide this recovery was not due to destruction of the poison outside the cells.

No relation existed between the capacity of a substrate to stimulate respiration and the final yield of growth it supported.

Minutes of the Section of Biology [4]

HORTON H. HOBBS, JR., *Chairman*
ROSCOE D. HUGHES, *Vice-Chairman*
A. M. SHOWALTER, *Secretary*
LADLEY HUSTED, *Section Editor* (1952)

FRIDAY, MAY 11, 1951 — 9:00 A. M. — BIOLOGY ROOM, BIOLOGY BUILDING

1. Abnormal Tooth Development in the Groundhog, *Marmota monax monax.*

Warwick R. West, Jr.; *Miller School of Biology, University of Virginia.*

A groundhog possessing excessively long incisors was brought to my attention, and after checking the literature it was found that this condition is quite rare. Only one other report was available which concerned a similar abnormal tooth development in the groundhog. Due to lack of contact between the upper and lower incisors, they will grow to extreme lengths. They appear to have completely lost their usefulness, but in spite of this, there seem to have been no decidedly harmful effects on the animals that have been studied. Reasons for this condition have been postulated but none of them seems adequately to cover the reported situations. The most plausable explanation is that the condition is brought about by an upset in the growth rate of the lower jaw with reference to the skull.

2. Sport Fisheries Management of Claytor Lake, a Mainstream Impoundment on the New River in Virginia.

Dean A. Rosebery; *Commission of Game and Inland Fisheries Richmond, Virginia.*

Claytor Lake, covering 4,495 acres of a mountainous section of Pulaski County, Virginia, was formed by the construction of a dam in 1939. The lake is 21 miles long, has a maximum width of one-half mile and a maximum normal pool elevation of 1,846 feet above sea level. During the period 1939-1946 the lake was stocked with 650,000 walleye fry, 74,854 young bluegills, 3,570 adult blue-gills, 12,040 adult yellow-belly sunfish, 20,135 young largemouth bass, 10,813 adult largemouth bass, 3,000 young smallmouth bass, and 3,894 young white crappie. In spite of the heavy stocking largemouth bass and yellowbelly sunfish failed to become important species in the lake. Until 1946 the impoundment was closed to walleye and bass fishing each year from December 31 to June 20. After 1946 all fishing was prohibited during the December 31 to June 20 period. Study revealed that the fishes exhibit slow growth for the first year but after the second year the growth rate is considered good. The fishes of the lake were estimated to be the following lengths in inches by the third year: bluegill 6.0, white crappie 8.0, spotted bass 10.7, smallmouth bass 10.9, largemouth bass 13.6, walleye 18.4, and yellow perch 8.5. The bluegill is the principal forage fish, but its population is restricted because of competition with the channel catfish and

crappie for food. Angling success on Claytor Lake is usually low. The returns during June and October, 1948, were 0.11 and 0.14 pounds of fish per hour, while in August 0.072 pounds per hour were taken. The harvest of bluegill, white crappie, walleye and channel catfish by anglers was low during the 1948 and 1949 fishing seasons. Anglers realized the highest rate of harvest, a 20 -30 percent return, from spotted and smallmouth bass, according to tagging returns.

3. A Morphological Study of *Neoechinorhynchus cylindratus*, a typical Representative of the Eoacanthocephala.

Harry L. Hollaway, Jr.; *University of Richmond.*

A detailed morphological study of *Neoechinorhynchus cylindratus* (Van Cleave, 1913), a piscine species of Acanthocephala, has been made using specimens isolated from the alimentary canal of fishes of the families Centrarchidae and Percidae. In the course of study a new locality record of the species has been established. The study indicates a geographical variance from piscatorial parasitology records in lengths of two of the proboscis hooks of the anterior circle and records smaller size of mature ova. A somewhat different apical organ is figured but it retains the previously reported eutely pattern. The presence of lobed giant subcuticula nuclei is noted and discussed. The morphological details of the male and female reproductive systems have been worked out.

4. Studies on the Postembryonic Development of the Head and Gnathothoracic Appendages of the Crayfish, *Cambarus longulus longulus Girard.* (Decapoda, Astacidae)

Paul J. Osborne; *Miller School of Biology, University of Virginia.*

This study of the postembryonic development of the appendages of the cephalic region of the crayfish had as its main purpose to determine to what extent one could rely on the structure of these appendages for identifying the several stadia in the maturation process. Because of the differential growth ratio in any brood, as well as the lack of striking morphological peculiarities of the successive instars, it has been impossible heretofore to determine with any degree of certainty the stadium of any crayfish. It has been found that the number of setae along certain podomeres of the cephalic appendages increase in a somewhat uniform pattern, and that the number of setae is a more reliable criterion for distinguishing the stadia than are differences in size or body proportions.

5. Studies on Crayfish Ovarian Extracts.

Cornelia Anne Tuten, *Miller School of Biology, University of Virginia.*

Ether extracts from the ovaries of crayfishes which were approaching the period of ovulation were injected in mineral oil solution into live animals that were either immature or that possessed ovaries which were in the resting stage. The ovaries of these animals enlarged and changed color and in some cases the cement glands appeared. These reactions were much more rapid than were the same reactions in animals which had received implants of dried ovarian tissue. Injections of mineral oil alone had no apparent effect on the animals.

Eyestalks were removed from female crayfishes with the result that the length of time required for preparation for ovulation was shortened.

6. *Hemidactylium scutatum* (Schlegel): Nesting in Virginia.

John Thornton Wood, *College of William and Mary.*

Egg groups of the "rare" Four-Toed Salamander, *Hemidactylium scutatum* (Schlegel), have been found in the following Virginia counties: Appomattox, Charles City, Elizabeth City, Fairfax, Gloucester, James City, Mathews, Warwick, and York. Of 150 egg groups examined in the field, 96 were collected, along with attending females. In each "nest" eggs were counted and stage of development noted. The number of eggs per nest ranged from 16 to 868, and the number of attending females from none to three. The average number of eggs in 96 nests was 116. Females ranged in total length from 60 to 95 mm., averaging 77 mm. Many nests contained the complements of more than one female.

Egg groups were collected from the field from February twenty-fourth to April twenty-seventh and were found under bark, in rotted logs and boards, in mounds of pine needles, and in hollow cypress knees. The majority of the "nests" were attached to the shoots of mosses of the following genera: *Atrichum, Aulacomnium, Cirriphyllum, Climacium, Eurhynchium, Hypnum, Leucobryum, Mnium, Plagiothecium, Sphagnum,* and *Thuidium.* Eggs were also attached to the thallose liverwort, genus *Pallavicinia.* All nests were in damp places, near still or slow-moving water. Attending females were found beneath eggs, not coiled around them.

7. A preliminary Report on the Size, Egg Number, Incubation Period, and Hatching in the Common Snapping Turtle, *Chelydra serpentina.*

Roy P. Ash; *College of William and Mary.*

Two thousand, four hundred thirty-one (2,431) eggs were collected from the ovaries or oviducts of 85 mature female specimens. The carapace width and length were determined as well as the number of eggs per each individual. The number of eggs per individual varied from 13-48. A positive correlation was found between the carapace width and egg number. In the laboratory at room temperature the incubation period was from 75-95 days. Carapace width and length and "tail" lengths were determined for 195 hatchling turtles. A positive correlation was found between the length of the "tail" and the carapace width and also between the carapace length and the "tail".

8. A Comparative Study of the Morphology of Two Variants of *Prorhynchus stagnalis* Schultze.

Walter L. Richards, Jr.; *Miller School of Biology, University of Virginia.*

Two variants of the Alloeocoela, *Prorhynchus stagnalis* Schultze, inhabit a drainage ditch on the grounds of the University of Virginia. Seasonal fluctuations in the populations of these two forms are discussed, and their morphological differences indicated.

9. The Aquatic and Semi-Aquatic Hemiptera of Virginia.

Marvin L. Bobb; *Virginia Agricultural Experiment Station, Research Laboratory, Charlottesville.*

Studies on the aquatic and semiaquatic Hemiptera of Virginia were begun in 1946. At that time only 20-odd species had been recorded from the Commonwealth. During the past four years collections of these

insects have been made in 79 counties, and the State list now comprises 90 species dispersed among 29 genera. All of the 13 families are represented.

10. Cecidogenic Material in *Hormaphis hamamelidis*.

Ivey F. Lewis and Lucile Walton; *University of Virginia* and *Washington High School, Danville*.

In the first generation (stem mother) at about the time of hatching, cecidogenic material with its characteristic crystalline appearance is found in the mycetome, from which it passes at an early stage into the salivary (thoracic) gland. Here it accumulates, especially in the nucleoli of the large secreting cells of the compactly organized gland.

In the second generation the gland undergoes a certain disorganization. Large vacuoles appear in the cells, but little cecidogenic material is found there. The wandering "X-cells" contain many granules even before the hatching of the first instar. These granules are carried by the X-cells to and into the mycetome.

In the third generation the X-cells are more numerous (30-40) and even more loaded with cecidogenic granules. These granules occur abundantly also in the mycetome and in the nurse cells of the developing egg. They pass into the egg through the protoplasmic strand extending from the nurse cells and also directly through the epithelial envelope. Their fate in the egg has not been followed in detail, but they are found in the mycetome of the developing embryo. From the mycetome they are carried into the salivary gland, and from it they are injected into the witch hazel leaf.

11. A Study of the Monogenetic Trematodes from the Gills of Westhampton Lake Fishes, with Additional Notes on Other Organisms Taken from the Gills.

William J. Hargis Jr.; *University of Richmond*.

This study represents the first concerted work on the monogenetic gill parasites ever undertaken in Virginia. It is unique in that it presents a new region and locality for all of the forms studied and it is the result of collecting from one body of water throughout several seasons.

A new technique of mounting the parasites (Monogenea) directly into Euparol without staining was developed for this study. It gives the required clarity as well as permanence.

A total of 4,523 flukes representing 25 species of the Monogenetic genera *Cleidodiscus* Mueller, 1934; *Actinocleidus* Mueller, 1937; *Urocleidus* Mueller, 1934; *Dactylogyrus* Diesing, 1850; *Gyrodactylus* Nordmann, 1832; and *Octomacrum* Mueller, 1934 were recovered from the branchial material of 107 host specimens representing 7 species of the piscine families Ameiuridae, Centrarchidae and Cyprinidae. Microscopic study of these forms yielded new structures, forms, and problems.

In addition to the monogenea, glochidia, copepods, rotifers, and arthropod, a nematode and a digenetic fluke were taken. The latter three were probably accidental residents of the gills.

It is known that these parasites (Monogenea) are of some importance in fishery operations and the author is of the opinion that they play a part in the high "spring-mortality" which occurs in some of the bodies of water throughout Virginia.

12. The Effects of Inanition on the Fresh-Water Nemertean Worm, *Prostoma rubrum*.

Solomon Kadis; *Miller School of Biology, University of Virginia.*

While inanition experiments have been performed on marine nemerteans and the results obtained have been assumd to illustrate the general pattern for the animals in this phylum, no detailed studies of the effects of starvation have been undertaken on the fresh-water forms. An attempt is made to indicate the ways in which the fresh-water ribbon worm, *Prostoma rubrum*, differs from the marine species in its reactions to inanition. Individuals of *Prostoma rubrum* were maintained in the laboratory for a maximum period of 150 days without food. During that time the gross morphological changes observed were the reduction in the size of the body to a small fraction of that previous to the initiation of the experiments, and the development of a dark pigment in the body epithelium. The histological alterations noted include the vacuolation of the ciliated cells of the body epithelium, and the distintegration of the oocytes and some of the structures of the digestive system. Since the method by which the oocytes of *Prostoma rubrum* receive their yolk material appears to be unlike that of any of the other invertebrate animals, the fate of the oocytes during inanition is stressed.

13. The Report of a Microscopic Observation Regarding a Specific Effect of Certain Pathogenic Bacteria on the Erythrocytes of Man.

Grace J. Blank; *College of William and Mary.*

While making a study of the chemotactic response of leucocytes to various microorganisms, it was noted that there was a profound negative response by the erythrocytes to certain pathogenic bacteria, and that in the case of *Diplococcus pneumoniae*, at least, this response was definitely related to the capsules of these organisms and also paralyzed the initial strong positive movement of the neutrophiles toward these organisms. In the light of more recent studies by many investigators relative to the effect upon erythrocytes in vivo of certain infectious diseases, it seems worthwhile to contribute this in vitro observation.

14. Antibiotic Assay of Some Prairie Flowering Plants.

Lowell V. Heisey; *Bridgewater College, Bridgewater.*

A systematic survey has been made of the antibiotic-type of properties of some native plants of the plains and prairie region of the United States. Special emphasis was given to plants used in Indian and pioneer medicinal remedies, and also to the more vigorous weeds of that area, for their possible economic value. Solvent extracts of the plant tissues were tested by the paper disc method of antibiotic assay, using as test organisms, *B. subtilis, Staph. aureus, E. Coli,* and *Pen. notatum.*

It was found that eighty species of the 116 different plant species tested exhibited inhibitory power against one or more of the test organisms. These plants were collected mainly in Kansas and represent forty-eight different plant families. In general, members of one plant family tended to exhibit the same type of activity. Some of the plant species exhibited a sufficient degree of antibiotic activity to warrant further study. These included some plants now classified as weeds and a few of the pioneer herbs.

15. Evidence of Ionization Currents within the Marine Amoeba, *Flabellula mira* Schaeffer, as a Result of Motion within a Magnetic Field of 2300 Gauss.

Zoe Wells Carroll Black; *Mary Washington College of the University of Virginia, Fredericksburg.*

Previous reports to this section have summarized evidence that ameoboid cells of the earthworm are sensitive to the effect of passage through a magnetic field of 2300 Gauss.

More recent studies have indicated that the reaction of amoeboid cells may be a generalized one, regardless of whether the cell is free-living or a part of a metazoan body.

Evidence is now presented to show that in *Flabellula mira*, a marine amoeba, there is a measurable shift in cellular iron and the lipids which blacken with osmic acid as a result of one hundred times passage through a magnetic field of 2300 Gauss.

16. Chromosomes of Certain West African Plants.

J. T. Baldwin, Jr. and Bernice M. Speese; *College of William and Mary.*

Chromosome numbers for the following genera in West Africa are reported: *Flagellaria, Tacca, Chlorophytum, Haemanthus, Crinum, Clappertonia, Physalis, Strophanthus.*

17. Chromosome Numbers of Three Species of *Amaryllis.*

Thelma L. Ficker; *Blandy Experimental Farm, University of Virginia, Boyce.*

A cytological study was made of the type species of the genus *Amaryllis, A. belladonna* Linn. This species is broad-leaved and has a 2n chromosome number of 22, which has been considered as the diploid number for the genus.

Two species of the narrow-leaved subgenus *Chilanthe* (Traub) proved to have a 2n chromosome number of 18.

Theories are advanced for the possible origin of the 18-chromosome species.

18. Locus of Natural Selection in an Experimental Population.

Max Levitan; *Department of Biology, Virginia Polytechnic Institute.*

In an experimental population of two chromosomal variants of *Drosophila robusta*, an equilibrium between them was established through action of natural selection. The population was apparently panmictic. In the females there was significant differential survival between egg and adult stages favoring the heterozygotes. No such differential survival was detected in males. The relative survival values obtained for the females were similar to the relative adaptive values calculated from the rate of exchange of these variants in prior generations. This indicates that differential survival among the females was the primary, if not the sole, factor in natural selection in this population.

19. A Spontaneous Sterile Hybrid between *Celosia argentea* and *Celosia argentea* var. *cristata*.

William F. Grant; *The Blandy Experimental Farm, University of Virginia, Boyce.*

Quail grass, *Celosia argentea* L., and the common ornamental fasciated cockscomb, *Celosia argentea* var. *cristata* (L.) Ktze., have been grown side by side at the Blandy Experimental Farm for several years. From several thousand seedlings of C. *argentea*, which have bred true for a number of years, an aberrant plant was observed by Dr. Orland E. White. This plant was found to be almost sterile. Upon cytological examination the plant was found to possess a chromosome number of $2n = 54$. A cytological examination of the putative parents yielded a chromosome number of $2n = 72$ (*C. argentea*), and $2n = 36$ (*C. argentea* var. *cristata*), which confirms the chromosome numbers as reported by Wakakuwa in 1931. This, along with morphological evidence, indicates the plant is a hybrid. Fourteen seeds were collected from this hybrid, and eight seedlings have been obtained. Three seedlings have been obtained. Three seedlings have been examined cytologically, and have a chromosome number of $2n = 54$. These eight F_2 plants have reached the flowering stage, and in general morphological features are much like the F_1 hybrid. A number of other collections of *Celosia* are being investigated to determine the stability of the chromosome number of the parental types, and will be reported on at a later date. At the present time five different collections, from different Botanic Gardens, of the *C. argentea* parent have been examined, and all possess a chromosome number of $2n = 72$, and sixteen collections of the fasciated types have been examined, and all possess a chromosome number of $2n = 36$. Some of the different fasciated types examined are: Fiery Feather, Plumosa, Childsii, Dwarf White, Gilbert's Harlequin, and Thompsonii.

20. Growth Responses of *Datura stramonium* Embryos to Certain Nucleic Acid Components.

Jacques Rappaport; *Miller School of Biology and Blandy Experimental Farm, University of Virginia.*

Ribonucleic acid (RNA) and desoxyribonucleic acid (DRNA) have different inhibitory effects on embryo cultures of *D. stramonium*. RNA was found to inhibit $\pm$ 70% whereas DRNA caused only $\pm$ 15% inhibition. These two nucleic acids, aside from the difference in their sugar components, differ in one pyrimidine constituent, uracil in RNA and thymine in DRNA. In preliminary tests, effects of some nucleic acid components if added individually to embryo cultures were investigated. Thymine, guanine, adenine, and d-ribose did not show any significant effect on embryo growth, whereas uracil showed an inhibition of $\pm$ 40% at a concentration of 100 p.p.m. and at 2 weeks after its addition to the medium. This inhibition, however, did not remain constant at subsequent measurements. During the third and fourth week after the treatment a regression in the inhibition was observed. At the end of the fifth week the growth curve of the treated embryos reached the level of the controls. Whether this regression in the inhibition caused by uracil is due to (1) a gradual adaptation of the embryos to the presence of uracil or (2) to the gradual disappearance of the uarcil in the culture medium will be investigated.

21. The Prothallus of *Asplenium montanum.*

Muriel P. Hegwood; *Miller School of Biology, University of Virginia.*

The occurrence of the prothallus of Mountain Spleenwort, *Asplenium montanum* Willdenow, is reported in Giles County, Virginia near the Mountain Lake Biological Station where it has become perennial under low illumination (1 - 3 foot-candles). It has an irregular configuration and proliferates vegetatively. It also produces linear gemmae which withstand extended drought and germinate into new prothalli under favorable conditions. Binucleate cells are occasionally observed in the prothallus adjacent to non-nucleate cells.

Normal sex organs are borne by the prothallus, but no normal gametes are produced. However, a few sporophytes are produced by the prothalli, but are unable to survive under the low light intensity. The appearance of sporophytes in the absence of normal gametes indicates possible apogamy in *Asplenium montanum.*

22. The Alternation of Generations.

A. M. Showalter; *Madison College.* (Presented by title.)

23. Distribution of *Xerophyllum asphodeloides* (L.) Nutt. in the Massanutten Mountains.

Lena Artz; *Waterlick.*

One of the conspicuous members of the New Jersey Pine Barren flora is *Xerophyllum asphodeloides* (L.) Nutt.

In Virginia, this member of the Liliaceae is known in the Alleghany, Blue Ridge, and Massanutten Mountains. In the Massanutten area, in the counties of Page, Shenandoah, and Rockingham, Turkey Beard seems to be limited to the dry sandstone soils of the western slopes of the inner ridges.

The plant associates of Turkey Beard in each locality in the Massanutten area are almost invariably the same. Among these associates are, always, scrub oak, mountain laurel, wintergreen, bracken fern, and others.

24. A Naturally-Occurring Triploid Juniper.

M. L. Stiff; *Blandy Experimental Farm, University of Virginia, Boyce.*

Juniperus virginiana L., the common red cedar, has been reported by Sax and Sax (1933) as having a chromosome complement of $2n = 22$. In the summer of 1950, a triploid Juniper ($3n = 33$) was discovered at Blandy Experimental Farm. The polyploid form has been compared with the diploid form in regard to chromosome morphology, stomatal size and vascular anatomy. Due to the immaturity of the specimen, pollen morphology could not be compared.

25. New or Interesting Bryophytes Collected by Bayard Long in Southeastern Virginia.

Paul M. Patterson; *Hollins College.*

In this preliminary report on a collection of nearly 500 numbers made at various intervals between 1934 and 1942 by Dr. Long, the following may be noted.

Range extensions: *Anthoceros Ravenelii,* a southern coastal plain and tropical hepatic is reported for the first time north of South Carolina. *Mnium cinclidioides,* a boreal, circum-polar moss of cold bogs and swamps is here reported for the first time south of New Jersey.

New records for the state: The two peat-mosses, *Sphagnum erythrocalyx* and *S. macrophyllum,* brings the total for this group to 22.

Rare or interesting bryophytes previously reported in Virginia from one or two counties. The figures after the names indicate the number of additional counties where they are now known to occur as a result of Dr. Long's collections. The first seven of these were new records or range extensions in the 1950 publications on Virginia bryophytes.
Hepatics: *Frullania Kunzeii,* 1; *Leucolejeunea conchifolia* this, the third collection in the state, duplicates a former county.
Mosses: *Sphagnum cyclophyllum,* 3; *S. tabulare,* 1; *Brachelyma subulatum,* 1; *Fissidens Julianus,* 2; *Helodium paludosum,* 1; *Sphagnum cuspidatum* var. *Torreyi,* 1; *S. magellanicum,* 2; *Homalotheciella fabrofolia,* 1; *Leskea arenicola,* 1; and *Syrrhopodon texanus,* 1.

The total number of bryophytes now known from Virginia is 478.

26. The Occurrence and Ontogeny of Hydathodes in the Leaves of *Hygrophila polysperma.*

W. M. Reams, Jr.; *Department of Biology, University of Richmond.*

Hygrophila polysperma, a native of the East Indies, has recently been introduced into this country and has been found to flourish in ponds and streams of the Eastern states. This aquatic sends up aerial floral spikes which facilitate a comparative study of the variation in the morphology and ontogeny of two types of hydathodes, water-stomata and water-secretory trichomes, due to differences of environment. The aquatic leaves contain water-stomata and non-functional, recessed trichome-hydathodes; the raised, bulbous, functional trichome-hydathode, and water-stomata are typical of the aerial leaves; and upon the bracts are found only water-stomata, the trichome-hydathodes being replaced by simple linear hairs. The differentiation of the three trichome types commences after the second cell division of the primordium. Other points of interest, such as cystoliths, etc., are mentioned.

27. The Floral Morphology of *Cenchrus, Pennisetum, Setaria,* and *Ixophorus.*

Ernest R. Sohns; *College of William and Mary.*

The morphology of the fascicles of four genera of grasses is considered. The involucres of *Cenchrus* and *Pennisetum* are regarded as composed of first order branches and their associated lateral members more or less fused at the base. The fascicles of *Setaria,* each regarded as a small panicle, demonstrate the extreme in fascicle branching. The single bristle prolonged behind the spikelet of *Ixophorus* is regarded as a continuation of the axis.

28. The Effect of 2, 4-dichlorophenoxyacetic Acid on the Germination and Seedling Development of *Allium fistulosium.*

William R. Jenkins; *Miller School of Biology, University of Virginia.*

Previous results have shown that 2, 4-D inhibits seed germination

and causes severe morphological changes in seedlings developed from treated seeds. In this case, seeds of *Allium fistulosum*, var. White Portugal, were soaked for 24 hours in concentrations of 10, 100, and 1000 p.p.m. of the sodium salt of the acid. Germination was reduced to 16% in the highest, 34%, and 86% in the next higher concentrations. The control had a germination of 97%.

In developing, those seedlings from treatments of 100 and 1000 p.p.m. grew in an upside-down fashion, the root tips remaining in the air and not reentering the soil as in the normal condition. In neither of these cases did the root length exceed 4 mm. and all died by the fifteenth day. It was noted, in microscopical sections, that there was no elongation of the cells in the area of elongation of these roots.

Swollen regions, about twice the size of the normal stem, were noted just above the root-shoot transition area. It was seen in sections that the cells of the cortex were greatly enlarged, and with treatment of 1000 p.p.m. the cell walls of these cells appeared to be disintegrating.

Fine stainless steel surgical suture wire is sewn through the exoskeleton and soft tissues from one point on an epimeral line to another point on the same line so chosen that the wire lies perpendicular to the lines and in an anterior-posterior direction, and the serially numbered tag is attached to the loose ends of the wire.

29. Orcein, Orange G, and Picric Acid Staining as Applied in Skin and Fiber Studies.

Lubow A. Margolena and Ethel H. Dolnick, *Animal Fiber Laboratory, Bureau of Animal Industry, U. S. Department of Agriculture.*

Staining procedures were developed to facilitate observations of skin differentiation and fiber growth in wool and fur bearing animals. One method in which acid orcein, Mallory's phosphomolybdic acid, anilin blue, and orange G were used, followed by alcoholic orange G, is particularly recommended for the differentiation of elastic and collagenic fibers, keratin and blood capillaries. A second method employs ferric chloride hematoxylin which is destained by picric acid and counterstained by fast green. This procedure offers a dependable check on the first method as far as keratinization is concerned, for picric acid is as good a keratin stain as is orange G. In addition, the ferric chloride hematoxylin, picric acid, fast green combination gives a clear picture particularly suited for studies of sebaceous glands and chromatin behavior.

30. A New Method for Tagging the Immature Edible Blue Crab, *Callinectes sapidus* Rathbun.

Willard A. Van Engel; *Virginia Fisheries Laboratory, Gloucester Point.*

The application of serially numbered tags in life history studies of the blue crab, *Callinectes sapidus* Rathbun, heretofore has been limited to sexually mature crabs. The attainment of sexual maturity is accompanied by a cessation of growth; molting does not occur again, and therefore tags strapped to the carapace are retained for the remainder of the life of the crab.

Molting, and hence growth, of the immature is accompanied by the loss of any tag externally strapped to the carapace. In devising a method for affixing a tag that would be permanently retained, advantage is

taken of the fact that during molting the separation of the exoskeleton into dorsal and ventral portions occurs along definite lines of dissolution, the epimeral lines.

31. Expanding Seed-Oyster Production in Virginia.

Jay D. Andrews; *Virginia Fisheries Laboratory, Gloucester Point.*

Most oyster planters in Virginia transplant young oysters from seed beds to growing grounds where they are left until large enough to harvest. A continuous and abundant supply of seed is essential to the industry. While at present most seed oysters are produced in the James River, records over the past few years indicate there are a number of small rivers and tributaries in Tidewater Virginia which have an annual set of young oysters in sufficient numbers to be used as seed areas. Development of new seed areas close to the growing areas would reduce transportation costs and furnish more seed oysters at a cheaper price.

32. Range and Habitat of the Clam *Polymesoda caroliniana* (Bosc) in Virginia (Family Corbiculidae).

Jay D. Andrews; *Virginia Fisheries Laboratory, Gloucester Point.*

Polymesoda caroliniana (Bosc), a brackish water clam which ranges north from Vera Cruz, Mexico, has not previously been reported north of the Neuse River, N. C. Specimens have been collected in the James River from Jamestown Island to the mouth of the Warwick River, a salinity range of nearly fresh water to 15 parts per thousand respectively.

Several diverse-appearing intertidal habitats are described, all of which provide protection from the mechanical action of waves and tides.

33. Gray's Manual of Botany, Eighth Edition and its Influence in Developing a Virginia Flora.

A. B. Massey; *Virginia Polytechnic Institute.*

The appearance of the eighth edition of Gray's Manual of Botany by M. L. Fernald gives a distinct impetus to those working on the plant life of Virginia. Gray's manual has been the authority in botany of the northeastern states for more than 100 years. Fernald was junior author of the seventh edition, which was published in 1908. The eighth edition is the culmination of the life work of Dr. Fernald. Being especially active in the field, Fernald has woven into the eighth edition much valuable information not found in the earlier editions. The results of extensive field studies in southeastern Virginia are incorporated in the manual; hence it is especially an asset to the work leading to a Flora of Virginia.

34. Some Problems and Difficulties in the Study of the Myxophyceae.

Elton C. Cocke; *Wake Forest College, Wake Forest, N. C.*

The study of the blue-green algae presents a number of difficulties and problems, not the least of which is the lack of a good book on the identification of this group. Correct identification to species necessitates the examination of the plants in the mature form and with gonidia or hormogonia in ripe condition. So frequently specimens are encountered in which the spores or hormogonia are not present. Furthermore, many forms vary accroding to habitat; this makes more difficulties for phycologists. Some specific variations due to environmental conditions will be discussed in this paper.

Minutes of the Section of Chemistry [5]

J. ROBERT TAYLOR, *Chairman*
W. SCHUYLER MILLER, *Secretary*
WILLIAM E. TROUT, JR., *Section Editor* (1952)

FRIDAY, MAY 11, 1951 — 9:30 A. M. — AUDITORIUM, MAIN BUILDING

Announcements. Chairman J. Robert Taylor; *American Viscose Corporation, Roanoke.*

1. Some Factors Influencing the Color and Composition of Complex Ions in Aqueous Solutions.
James W. Cole, Jr. and Lewis G. Cochran; *University of Virginia.*

The development of a reasonable theory of color of inorganic complex compounds and ions is one of the major fundamental problems of chemistry. Before such a theory can be proposed, more systematic experimentation is needed on the structural and energy factors which give rise to color in some of the well-known substances. The present work represents a progress report on experiments with compounds of cobalt, nickel, and copper, in which their ions are complexed with water, ammonia, polyamines, ethanolamines, glycols, and amino acids. Each series of compounds was examined chemically, electrometrically, and spectrophotometrically and the results correlated. It appears that the pH and particularly the hydroxyl ion concentration are more important factors than heretofore assumed, in detremining the wave length of maximum light absorption and the extinction coefficient. The new integrated absorption variation method for ascertaining the number of complexing addenda, as reported previously by Cole and Chilton, seems more adaptable to the systems studied than some of the standard methods, such as the technique of continuous variations.

2. Spectrochemical Analysis of Blood.
Ralph E. Thiers and John H. Yoe; *Pratt Trace Analysis Laboratory, University of Virginia.*

This paper is a progress report on the spectrochemical analysis of blood for traces of metals going on at the Pratt Trace Analysis Laboratory of the University of Virginia.

The work is part of a survey of a large number of blood samples undertaken in cooperation with a group under Dr. B. S. Leavell in the Department of Hematology of the University of Virginia Hospital. Very complete medical histories are taken as well as much information which might influence trace element contents.

Samples are being taken from normal people as well as from patients, most of whom are suffering from blood diseases.

Extreme care is being taken to prevent contamination, and to date three hundred samples have been taken and stored until analysis in high-purity polyethylene bottles.

Qualitative analytical data for twenty-four samples, showing 24 elements, and semiquantitative data for nine elements in forty samples are given.

When a sufficiently large number of analyses have been made, correlations between medical data and trace element data will be sought.

3. Spectrophotometric Studies on the Reaction of Platinum with Compounds Containing the p-Nitrosophenylamino Group.

J. Jack Kirkland and John H. Yoe; *Pratt Trace Analysis Laboratory, University of Virginia.*

A progress report is given on the reaction of platinum with compounds containing the p-nitrophenylamino group to give strongly colored complexes suitable for the colorimetric determination of trace amounts of this metal. Special techniques are necessary in order to develop the complex for satisfactory colorimetric studies. Limit of sensitivity of p-nitrosodimethylaniline reagent is one part in 200,000,000 parts solution.

4. New Synthesis of Aromatic Phosphorus Compounds.

Alfred Burger and Norman D. Dawson; *University of Virginia.*

A new Grignard method has been developed whereby aromatic phosphonic acids ($ArPO(OH)_2$) of definitely predictable structure may be prepared unaccompanied by triarylphosphine oxides or phosphines which are the main products from the action of phosphorus halides on Grignard reagents.

Dialkyl chlorophosphates were chosen as reagents for the preparation of dialkyl aryl phosphonates because their lone chlorine atom could be expected to be eliminated first with the establishment of carbon-to-phosphorus linkage, while the ester groups would remain unaffected if the arylmagnesium halide has been largely consumed. The results of our investigations indicate that this is the mechanism involved. The reaction has been extended to include organolithium compounds with analogous results.

Organic Reagents in Chemical Analysis.[1]

Ellen D. Valentine[2]; *George P. Phenix H. S., Hampton.*

Reactions in Gels; A Beginning in Colloid Chemistry.[1]

Marcella M. Eubank;[2][3] *Wilson Memorial H. S., Fishersville.*

5. Chemical Analysis of Oyster, Clam, Mussell, Anomia, and Barnacle Shells.

A. R. Armstrong; *College of William and Mary.*

The shape and thickness of oyster shells is often characteristic of the locality of growth. The shell composition is, however, independent of shell habitat. Oyster shells are composed of two types of deposits, "pearly", and "chalky", which vary in composition. The "chalky" deposits are the richer in magnesium and in organic material. Shells with a heavy periostracum, such as mussel, give high values for organic matter.

Magnesium was the most variable constituent. typical values follows:

Oyster		Clam	0.56%
whole shell	1.20%	Anomia	2.48%
chalky deposit	2.52%	Barnacle	**3.75%**
pearly deposit	0.97%		
Mussel	0.48%		

1 Honorable mention, National Science Talent Search.
2 Recipient of Virginia Section, American Chemical Society, Student Award.
3 Recipient of Catesby Jones Award.

6. The Reaction of Iron With Several Substituted Salicylic Acids.
Bernard Howard[2] and A. R. Armstrong; *College of William and Mary.*

The 5-sulfosalicylic acid forms iron [Fe^{III}] complexes of greater stability than the simple salicylic acid. The 3,5-disulfosalicylic acid may may therefore form iron complexes which are even more stable, hence suitable for study of structure.

The 3,5-disulfosalicylic acid has been prepared and a study of the complexes is to follow.

7. Progress Report on Chromatographic Adsorption Qualitative Analysis for Metal Ions.
Harriett H. Fillinger and Students (paper presented by Lois Ann Trafton); *Hollins College.*

For several years the study of the possible use of chromatographic adsorption methods in qualitative analysis for cations has been in progress at Hollins College with many students participating. A very satisfactory analysis for each group of a well-known scheme of analysis has been worked out. The chromatographic adsorption method, which is a rapid one, promises to have value as a supplement to classical qualitative analytical methods. It is hoped that a continuation of the study will result in a complete supplementary analysis. A brief summary of the results to date is given.

8. Preparation of Standard Hydrochloric Acid Solution from a Constant Boiling Solution.
J. B. Lucas, *Virginia Polytechnic Institute.*

Constant boiling hydrochloric acid is easily prepared by using equal volumes of concentrated HC1 and water and distilling from a side-neck flask. By the time one fourth of the solution has been boiled off, the remainder will have a constant boiling point. Distill over two thirids of what remains and discard the residue. The composition of this acid is given in most handbooks for different pressures. At the elevation of Blacksburg we have found that if the distillation is carried out at an atmospheric pressure of between 710 and 715 mm tenth normal acid can be prepared to an accuracy of plus or minus 0.0003 by diluting 32.6 ml of the constant boiling acid to two liters. The constant boiling acid does not deteriorate and enough may be prepared at one time to last for years.

9. The Determination of the Rare Earth Elements in Phosphate Rock.
C. W. Bondurant and J. B. Lucas; *Virginia Polytechnic Institute.*

A macromethod for the isolation and determination of the rare earth elements, e.g., R_2O_3, is presented. The phosphate rock samples are enriched with a known quantity of the rare earths. On the basis of the recovery of the rare earths from standard samples a reliable correction for the solubility loss is obtained.

The phosphate rock is dried and brought into partial solution with 1:1 HC1 followed by a 1:1 mixture of HNO_3 and H_2F_2. An oxalate precipitation from this solution results in the formation of the rare earth oxalates, some calcium oxalate, and occlusion of an appreciable amount

2 Recipient of Virginia Section, American Chemical Society, Student Award.

of $Ca_3(PO_4)_2$. Conditions of precipitation are carefully controlled to mimimize coprecipitation and solubility losses. Further separation of the rare earths is accomplished by an ammonium hydroxide precipitation from a buffered solution. The hydroxide precipitate is dissolved in HCl and then passed through an ion-exchange column containing Amberlite IRA-410 resin in the chloride form. This reduces the concentration of the phosphate ion. Further reduction of the calcium as a contaminant is accomplished by a second hydroxide precipitation. This precipitate is dissolved and then taken up in a 5% citric acid buffered solution (pH 3.5). The last traces of calcium are removed from the rare earths by passing the solution through a column containing Amberlite IR-120 resin in the NH_4^+ form. The rare earths are precipitated from the eluate as oxalates, and ignited to oxides. Results on standard samples and unknown Tennessee phosphate rock are given.

10. The Preparation and Some Reactions of a New Silicon Hydrocarbon.

H. Ritchey and H. C. Pitot; *Virginia Military Institute.*

A new organic-silicon compound, p-bis-trimethylsilyl benzene having the empirical formulas $C_{12}H_{22}Si_2$, was prepared from the di-Grignard of p-dibromobenzene and 2 moles of trimethyl-chloro-silane.

The compound is a white crystalline solid with a melting point of 93°. Analytical Data:

% C	Calculated 64.8	Found 64.62
% H	Calculated 10.0	Found 10.04

No silicon determination was made; however, the compound gave a very positive test for silicon. Some derivatives of this compound are now being prepared.

11. The Reducing Action of Different Metals in Liquid Ammonia.[4]

Robert C. Krug and George J. Hsieh; *Virginia Polytechnic Institute.*

Liquid ammonia is an excellent medium for reduction of metals since the ammonia dissolves the potent alkali metals. The metal-ammonia system has been widely investigated relative to the reduction of organic compounds. Although many peculiar effects as regards type and extent of reduction have been reported, relatively little work has been directed toward the investigation of the cause of these phenomena. A systematic investigation of the reducing action of different metals on an organic compound in liquid ammonia is reported for the first time.

The metals lithium, sodium and beryllium were used to reduce methyl ethyl ketone in liquid ammonia, in the presence of ammonium salts as proton donors. The greater the half-cell potential of the metal, the greater the extent of reduction effected by that metal. Results showed that a high concentration of the ammonium salt as a proton donor favors the formation of hydrogen and decreases the reduction of methyl ethyl ketone. A mechanism of the reducing action of the system metal-ammonium on methyl ethyl ketone is presented. The possibility of selective reduction of polyfunctional molecules is mentioned.

12. Electrodeposition of Thin Films of Titanium from Aqueous Solution.

Francis J. Denise and Henry Leidheiser, Jr.; *Virginia Institute for Scientific Research, Richmond.*

4 Honorable mention in the J. Shelton Horsley Research Award Competition.

Thin, bright, metallic films have been plated on copper from a titanium sulfate, citric acid, sodium hydroxide bath at high current density. The surface treatment of the cathode preceeding plating was important; the best results were obtained with electrolytically polished specimens. In many instances the deposits disappeared or turned black upon exposure to air. In other instances a bright metallic lustre was maintained in dry air for extended periods of time. Probable reasons for the inability to plate thick deposits of titanium are discussed.

13. The Development of the Electronic Theory of Aromatic Cyclodehydration.

Frank A. Vingiello; *Virginia Polytechnic Institute.*

A historical presentation of the mechanism of aromatic cyclodehydrations is given, beginning with a discussion of Bergmann's cyclization of o-benzylbenzophenone and his interpretation of the reaction. Berliner's and then Bradsher's contributions of this work are then discussed, followed by a presentation of the most recent electronic interpretation of the reaction.

14. The Synthesis and Cyclization of Some 2-(Substituted benzyl)-benzophenones.

Frank A. Vingiello and James G. Van Oot; *Virginia Polytechnic Institute.*

Bradsher and Vingiello's recently published mechanism for the cyclization of o-benzylbenzophenones was described (JACS *71* 1434 (1949)). In conclusion these authors stated that the rate of cyclization, for similar experimental conditions, depends on several factors, one of these being the electron density at the *ortho* position of the benzene ring into which cyclization takes place. We now have experimental evidence to substantiate this statement since we have synthesized and measured the rates of cyclization of several 2-benzylbenzophenones substituted in the benzyl ring. The results are summarized below.

Rates of Cyclization of Some 2-Benzylbenzophenones Substituted in the Benzyl Ring at 117.5°C

Compound	K, (hrs.$^{-1}$) x 10^{-2}
2-benzylbenzophenone	4.4
2-(2′-methylbenzyl)-benzophenone	15.4
2-(3′-methylbenzyl)-benzophenone	200.
2-(4′-methylbenzyl)-benzophenone	13.8
2-(3′-trifluoromethylbenzyl)-benzophenone	Does not cyclize in 10 days
2-(4′-fluorobenzyl)-benzophenone	Does not cyclize in 3 days.

In each of the ketones where a methyl group has been substituted in the benzyl ring, the rate of cyclization is greater than that of the unsubstituted 2-benzylbenzophenone. The methyl group presumably activates the ring toward electrophilic attack by the carbonium ion by increasing the electron density in the ring.

In line with the above observation is the fact that electron-attracting groups CF_3, and F, retard the reaction.

The syntheses of all new compounds are presented.

15. Urethans and Ureas from Cyclic Derivatives of Tris (hydroxymethyl) aminomethane.

J. Stanton Pierce and J. L. Rush, Jr.[2]; *University of Richmond.*

Tris(hydroxymethyl)aminomethane (A) reacts with cyclohexanone to form 8,8-bis(hydroxymethyl)-7-aza-10-oxaspiro(5.4)decane. The latter compound reacts with aryl isocyanates to yield 7-arylcarbamyl 1-8,8-bis (hydroxymethyl) -7-aza-10-oxaspiro(5.4)decanes which on mild hydrolysis yield N-aryl-N′-tris(hydroxymethyl)methylureas, the same products that are obtained by the reaction of aryl isocyanates and (A).

Mono-N-arylcarbamates of (A) can not be made directly from (A) but are prepared as the hydrochlorides by the reaction of aryl isocyanates with 5-hydroxymethyl-2,8-diphenyl-1-aza-3,7-dioxabicyclo (3.3.0) octane (from (A) and benzaldehyde) and the hydrolysis of the condensation products with hydrochloric acid.

16. Acylation of Tris (hydroxymethyl) aminomethane and Cyclic Derivatives.

J. Stanton Pierce, Carl D. Lunsford and Theodore Katz; *University of Richmond.*

Although direct monoesterification of tris(hydroxymethyl)-aminomethane (A) has not been carried out, monoacyl derivatives have been prepared by indirect syntheses involving 5-hydroxymethyl-2,8-diphenyl-3, 7-dioxabicyclo(3.3.0)octanes (B) and 4,4-bis(hydroxymethyl)-2-phenyloxazolines (C) as intermediates. In the synthesis involving (B), 4-acyloxymethyl-4-hydroxymethyl-2-phenyloxazolidine hydrochlorides and nitrates and 3-acyl-4,4-bis(hydroxymethyl)-2-phenyloxazolidines were isolated as intermediates.

A study is being made of the 4,4-bis(acyloxymethyl)-2-phenyloxazolines formed by the reaction of acyl halides and (C). Also, the diurethans of (C) are being studied.

17. A New Colorimetric Reagent for Molybdenum.

Fritz Will[2] and John H. Yoe; *Pratt Trace Analysis Laboratory, University of Virginia.*

Disodium-1,2-dihylroxybenzene-3,5,disulfonate ("Tiron") gives a bright yellow color with molybdate ions, suitable for the colorimetric determination of trace quantities of molybdenum. The effect of certain variables on the color reaction is discussed and the optimum conditions for its use as a reagent for molybdenum is given.

The compound is also a highly sensitive colorimetric reagent for trace amounts of titanium and iron, hence the name "Tiron." The latter uses have been reported previously by A. L. Jones and A. R. Armstrong, respectively.

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2 Recipient of the Virginia Section, ACS, Student Award.

2 Recipient of the Virginia Section, ACS, Student Award.

18. A New Colorimetric Reagent for Zinc.

Richard M. Rush[2] and John H. Yoe; *Pratt Trace Analysis Laboratory, University of Virginia.*

It has been found that zinc ions react with o-[L-(2-hydroxy-5-sulfophenylazo)-benzilidenehydrazino] benzoic acid, yielding a blue complex that is suitable for the determination of trace quantities of zinc. Various factors affecting the reaction are discussed, and a colorimetric procedure for zinc is outlined. A progress report.

Monosodium Glucamate as a Taste Enhancer.[1]

Fay F. Dixon[2]; *Wilson Memorial H. S., Fishersville.*

My Perfume and Making Money.[1]

Ada A. Blackwell[2]; *Wilson Memorial H. S., Fishersville.*

19. Effect of Substitution Degree on Fractionation of Cellulose Nitrate.

P. C. Scherer and Li-Hsi Lou; *Virginia Polytechnic Institute.*

The purpose of this work was to find a solvent-nonsolvent system that could be applied throughout all ranges of D. P. and D. S. The fractional precipitation method is similar to the one developed by B. J. Rouse in which he successfully fractionated cellulose nitrate of 12.12% N.

It was found that a system of ethylacetate and acetone mixture as solvent with aqueous acetone as nonsolvent is suitable for this purpose. The composition of the solvent and the nonsolvent are varied for different samples in order to get a hard precipitate and a flatter precipitation curve, both of which allow precise fractionation.

Standinger's viscosity method was used for D. P. determinations.

20. Effect of Substitution Degree on the Fractionation of Ethyl Cellulose.

P. C. Scherer and J. G. Iacoviello; *Virginia Polytechnic Institute.*

The purpose of this work was to find a solvent-nonsolvent system that could be applied throughout all ranges of D. P. and D. S. The fractional precipitation method employed is that which was used by Dr. R. McNeer for his Master's Thesis. His research was done with one sample of ethyl cellulose, having a D. S. of 48.7%. The particular system used by him, however, was not applicable throughout all ranges of D. S.

It was found that in order to dissolve all D. S. of ethyl cellulose, a mixed solvent must be used. The solvent employed was a mixture of benzene and methanol, and for high D. S. ranges a larger amount of benzene and a smaller amount of methanol (80-20) was used. As the D. S. decreased a slight increase in the amount of polar solvent (70-30) was used in the mixture. The nonsolvent used in all cases was heptane, usually mixed with some benzene so as to modify its precipitation action and to flatten the precipitation curve so as to allow precise fractionation. To determine the D. P., the Standinger method was used with calculated constants.

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2 Recipient of the Virginia Section, ACS, Student Award.
1 Honorable mention, National Science Talent Search.
2 Recipient of the Virginia Section, ACS, Student Award.

21. The Oxidation Rates of Different Faces of a Copper Single Crystal.

John V. Cathcart[2]; *University of Virginia.*

A method is described for accurately determining the oxidation rates of several crystal planes of a copper single crystal. The oxidations were followed by making oxide-thickness measurements with a polarizing spectrometer. The oxidation rates of the (100), (111), (110), and (311) faces of the crystal were determined at five temperatures ranging from 70 to 170° C. A regular variation in rate with temperature and crystal face was noted; at all temperatures studied, the faces in the order of decreasing oxidation rates were the (100), (111), (110), and (311). The ratio of the thickness of the oxide film on the face with the fastest oxidation rate, the (100), to that on the face with the slowest oxidation rate, the (311), varied from 2.1 to 10:1 depending on the temperature. It was also found that the presence of trace quantities of foreign materials during the oxidation caused a marked increase in the rates of oxidation of all faces.

22. Electrochemical Properties of Copper Single Crystals.

Lewis B. Johnson[2]; *University of Virginia.*

A study of the electrochemical properties of copper single crystals is extremely important from the standpoint of the corrosion of metals as well as from the standpoint of a more thorough understanding of the physico-chemical properties of metallic crystals.

Previous experiments carried out in this laboratory have shown that potential differences exist between (100) and (111) faces of a copper single crystal and that these potential differences are sensitive to changes in the solution and the gases dissolved in the solution.

The present investigation was undertaken for the purpose of carrying out corrosion experiments under more closely controlled conditions of surface treatment and dissolved gases. Furthermore, standard electrode potentials have been determined for five different copper crystals faces and compared to that of polycrystalline copper. A rough correlation has been found to exist between the oxidation rates of different crystal faces and the oxidation potentials.

Theories concerning the differences in potentials between different metals are reviewed, and attempts are made to apply these theories to explain the potential differences between crystal faces.

23. The Wettability of the Crystallographic Planes of Copper.

Jerome Kruger[2]; *University of Virginia.*

The degree of wetting can be measured experimentally by determining the angle of contact between a liquid and the solid upon which it rests, an angle of 0° indicating complete wetting, 180° non-wetting.

Zisman (*J. Colloid Sci. 2* 277 (1947)) has shown that certain long-chain molecules are adsorbed from their solutions on to metal surfaces, producing surfaces that exhibit high contact angles with water. Leidheiser (*NACA TA No. 982* (1945)) has shown that a spherical copper single crystal wets preferentially with respect to crystallographic plane in liquid stearic acid.

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2 Recipient of the Virginia Section, ACS, Student Award.
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2 Recipient of the Virginia Section, ACS, Student Award.

In this, as yet exploratory, investigation, a suitable apparatus for measuring contact angles was constructed. If the adsorption described by Zisman was allowed to reach equilibrium, the (111) and the (100) faces exhibited the same contact angle; but the rate of approach to equilibrium differed with crystal face, the rate of the (100) being greater than that of the (111).

It was also found that atmosphere plays an important role, hydrogen producing a decrease with respect to air in contact angle.

Differences in contact angle for mercury on different faces of copper and for water on oxidized copper were also found.

The results observed for copper containing a stearic acid film appear to fit in with Leidheiser's results and with oxidation studies.

24. X-ray Studies on Oxide Films on Copper Single Crystals.

Kenneth R. Lawless[2]; *University of Virginia.*

Previous investigations at the University of Virginia have shown the importance of crystal face and surface preparation in the oxidation of metals. A study has been made of the structure of the oxide film formed on defferent faces of copper single crystals under carefully controlled conditions. A special X-ray diffraction technique has been developed for these studies and is useful for studying thin films in the range from 100-5000 angstrom units.

It was found that the oxide film showed different orientations on different crystal faces. The oxide structure also varied depending on the thickness of the oxide film, the temperature of the oxidation, and the pressure of oxygen.

On all crystal faces the oxide was highly oriented at thicknesses up to 3000 angstrom units when formed at reduced pressure. The orientation at atmospheric pressure decreased regularly with increasing film thickness. The orientation increased with increasing temperature.

Contamination of the crystal surface was found to cause the oxide film to become more randomly oriented under all conditions.

25. Methods of Determining Surface Energy of Solids.

Peter B. Sherry[2]; *University of Virginia.*

Until recent times no experimental method existed for determining the surface energy or the surface tension of substances in the solid state; however, two recent investigations show promise.

Undin, in 1948, hung small copper wires of uniform cross-section in a sealed copper oven. To each of the wires was attached a small weight, and the entire system was evacuated and heated to a controlled temperature in the range in which creep is appreciable (900°C. to 1000°C.) The strain could then be found as a function of the stress, and the stress which produced no strain could be determined. From the geometry of the wire, the surface tension could be calculated. The lack of precision inherent in the experimental method and the changes in the crystal system due to creep are two fundamental difficulties in adapting this experiment to the study of single crystals.

Another approach to the problem of surface energy is the study of the surface by means of an electron beam. Certain preliminary work

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2 Recipient of the Virginia Section, ACS, Student Award.
2 Recipient of the Virginia Section, ACS, Student Award.

along these lines has been conducted. The electrons, in passing near the surface of a single crystal of copper, will be deflected, in different amounts, by the various faces of the single crystal. These deflections may be analyzed into the fields producing them, and it is hoped that a correlation can be made, on some theoretical basis, between these fields and the surface energy.

26. Catalytic Decomposition of Carbon Monoxide on Faces of a Nickel Single Crystal.

J. Bruce Wagner, Jr.[2]; *University of Virginia.*

Previous investigations at this laboratory (Leidheiser and Gwathmey, JACS 70, 1206 (1948)) have shown that carbon is selectively deposited on the (III) face of a nickel single crystal from the catalytic decomposition of carbon monoxide.

Further preliminary studies have been carried out in order to learn more of this reaction. The single crystal sphere of nickel has been subjected to various surface roughening treatments (e.g., electrolytic etching, etching in various acids, the catalytic reaction of hydrogen and oxygen on the surface, and the effect of tank ammonia on the surface) prior to the deposition of carbon from the catalytic decomposition of carbon monoxide.

Results have shown that in all experiments performed, the deposition of carbon was always on the (111) face of the crystal regardless of previous surface treatment, the only effect being a difference in the length of time required for the carbon deposition. It was suggested that the roughening of certain crystal faces often produced facets on these faces parallel to other crystal planes. However, the carbon pattern obtained was the same for all cases observed. These results seemed to indicate that the catalytic properties of the faces are somehow associated with the arrangement of atoms beneath the surface.

27. The Effect of Metallic Salts on the Production of Acid by Saliva Containing Sucrose.

J. D. Smith and J. C. Forbes; *Medical College of Virginia.*

One of the major factors in dental caries is the production of acid from fermentable carbohydrates by organisms in the mouth. The inhibitory effect of various organic and inorganic metallic salts on the production of acid has been studied by adding sucrose and a solution of the metal salt to freshly collected saliva. Copper, nickel, gold, silver, and mercury salts exerted the greatest inhibitory effect, while magnesium, cobalt, manganese, aluminum, iron, and chromic salts showed little or no activity. Copper concentrations as low as 0.25 mg per 100 ml of saliva, with added sucrose, showed definite inhibition of acid production. In a number of tests the mouth was washed with a solution containing small amounts of a copper salt, and saliva samples were collected at intervals thereafter. Sucrose was added to the samples and after incubation for 24 hours the pH of each was determined. Noticable inhibition of acid formation was shown by mouth-wash solutions containing as little as 9.4 mg of copper per 100 ml. When the mouth was washed with a copper salt solution at intervals during the day, the inhibitory action could be maintained for a 24 hour period.

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2 Recipient of the Virginia Section, ACS, Student Award.

28. Study of the Two-Liquid Phase Region of the System, UO_2SO_4 - H_2SO_4 - H_2O.

C. H. Secoy and R. E. Leed;[1] *Oak Ridge National Laboratory, Oak Ridge, Tennessee.*

The effect of sulfuric acid of varying concentrations on the temperature-concentration diagram for the system uranyl sulfate and water in the vicinity of the two liquid phase region was studied.

The acid was found to increase the miscibility and to shift the minimum critical solution point to higher temperatures. The upper limit of the two liquid phase region is the critical temperature of the water-rich phase at which the water-rich phase becomes identical with the vapor phase and the system gains a degree of freedom. The addition of sulfuric acid elevates the upper critical temperature, not only because of the acid present, but also because of the increased solubility of the uranyl sulfate in the super-critical fluid.

The appearance of the two liquid layers was observed by the following steps: (1) a weighed amount of water and sulfuric acid of known molarity and a weighed amount of uranyl sulfate of known composition were placed in a heavy wall quartz capillary tube; (2) permanent gases were removed from the tube by alternate freezing and thawing of the contents under vacuum; (3) the tube was sealed off and inserted in an aluminum core bomb wound with nichrome, attached to a shaker; (4) after equilibrium conditions were obtained, the temperatures were read by an iron-constant in thermocouple at the appearance and disappearance of the two liquid phases within 0.50°C.

At the higher acid concentrations the limitation was the inability to prepare quartz tubes with sufficient strength to withstand the high pressures developed.

BUSINESS MEETING

W. Schuyler Miller, *Randolph-Macon College,* was elected chairman and Henry Leidheiser, Jr., *Virginia Institute for Scientific Research,* was elected secretary of the Chemistry Section for the year 1951-52.

Minutes of the Section of Education [6]

R. CLAUDE GRAHAM, *Chairman*
Z. T. KYLE, *Secretary*
FRANCIS G. LANKFORD, *Section Editor* (1952)

FRIDAY, MAY 11, 1951 — 9:00 A. M. — ROOM 25, MAIN BUILDING

THE ACCREDITATION OF VIRGINIA SCHOOLS

1,2. Round-table discussion of "Standards for Accrediting the Secondary Schools of Virginia" and "The Standards of the Commission on Secondary Schools of the Southern Association of Colleges and Secondary Schools."—led by Thomas T. Hamilton, Director of Secondary Education, *State Department of Education,* and B. L. Stanley, Chairman of the *Virginia State Committee of the Southern Association.*

3. The Elementary School Principalship.

Davis Y. Paschall; *Director of Elementary Education.* (Presented by title.)

4. Report of Teaching Success of Recent Graduates of Radford College, as Measured by: (a) Superintendents, Principals, and Supervisors; and (b) Graduate's Estimate of Extent College Courses Contributed to Teaching Success.

Minor Wine Thomas; *Radford College.* (Presented by title.)

BUSINESS MEETING

The Committee on Nominations, composed of A. L. Wingo, Chairman, Thomas T. Hamilton, and Floyd F. Swertfeger, presented the following report: "Your Committee makes the following nominations: Z. T. Kyle,Chairman, Supervisor of Guidance and Adult Education, State Department of Education; Jack Boger, Secretary, Assistant Supervisor of Research, Richmond City Schools; and Francis G. Lankford, Jr., Education Editor, Virginia Journal of Science." On motions the nominations were closed and the report of the Nominating Committee was adopted by unanimous vote.

5. Is the Lecture Method of Instruction Outmoded in Education?

A. W. Hurd; *Medical College of Virginia.*

One of the solicited student suggestions given us in the last two years criticizes long and boring lectures as most unsatisfying aspects of medical instruction. In hundreds of remarks made by students, there are many criticisms of lectures as the most common form of instruction.

The students generally feel that they learn better by concentrating on laws, principles, and generalizations rather than by too much attention to details; by work in trying to solve problems related to the work for which they are preparing; by setting up individual projects which require student initiative and planning. They wish to meet situations to which they are to be exposed later so as to give best judgments indicated by keen and discriminating understanding of the total situation. They do not feel that the lecture method gives them enough chance for the practiced exercise needed in their professional work.

Furthermore, they would like more frequent and more objective evaluation of the work in which they are engaged in school. They think they learn best by having clearly-thought-through goals in mind; individual planning of the best means by which to reach these goals; personal activity in the *doing* process; and frequent evaluation of their progress toward the achievement of the goals.

At the recent convention of educational organizations in Atlantic City, one report given intimated that a particular college was advisedly eliminating the lecture plan. There seems to be a growing criticism of its values.

6. Relationships among Certain Educational Variables.

Alonzo M. Myster and Esther V. Short; *Virginia State College.*

This paper is based upon performances of pupils on a standardized test designed to measure achievement in reading, vocabulary, arithmetic fundamentals, arithmetic problems, English, literature, geography, science and spelling. Measures of the performance of Negro pupils of the seventh grade, enrolled in the public schools of a certain county of Virginia, represent the data of the investigation. Estimates of the coefficient of correlation, and of variance of each variate, are presented for schools having one teacher, two teachers, six teachers, and ten teachers.

Estimates of the parameters of correlation and variance differ widely from one type of school to another. The presentation and interpretation of the results emphasize implications for the statistical design and analysis of educational investigations.

7. The Language Development of Bilingual, Identical Twins, In English and Chinese, with Educational Implications for Language Teaching.

C. Hart Westbrook; *University of Shanghai.*

Both had I.Q. 133 at 1½ years (Merrill-Palmer); social, learning situaitons kept as nearly equal as possible. Parents used English, servants used Chinese, chiefly, first two years. First word, Chinese, 168th day, by both; first English, both, 36th week; bye-bye, dada, wa-wa, Ah! (desired object). 1 year, both 14 words (6 Chinese, 8 English). Greater vocalizer slightly delayed associating word-meanings. Both made almost same sounds. Only six English sounds (vowels) recorded not in Chinese. Only bilingual consonants not heard were: f, j, q, v; x, not listed; z, infrequent initially. One nasalized vowel, *-ong*, only Chinese. Twenty-three common vowel sounds and dipthongs used. Ou and Yu, hard for foreigners, not observed.

The Chinese words and phrases, number 512, when added to the 589 English words and phrases, total 1101, 81 in excess of the 1020 norm

of Smith's Vocabulary list. But the bilingual situation, despite parents' efforts to make the situation as favorable as possible for English, the mother tongue, had been harmful for the English development.

The deficiency according to Smith's list for the twins would be: 1020 - 740 = 280 Words, or 27.45% English Vocabulary deficiency.

Allowing for errors of observation and sampling, the twins in their situation were at a definite disadvantage, and it was not until ten years of age that they had finally come up to the average English vocabulary for children of their own mental age and I.Q. who are monolinguals.

Minutes of the Section of Engineering [7]

R. E. L. GILDEA, *Chairman*
B. A. NIEMEIER, *Secretary*
NELSON F. MURPHY, *Section Editor* (1953)

FRIDAY, MAY 11, — 9:00 A. M. AND SATURDAY, MAY 12
ROOM 12, MAIN BUILDING

1. Rigid Space Frame Analysis Using Successive Corrections.

D. H. Pletta and R. J. Tedaldi, *Virginia Polytechnic Institute.*

The analysis of rigid space frames by moment distribution involving successive sideway corrections in two horizontal directions is applied to a simple, three-dimensional rectangular frame. This method produces savings of time and labor over conventional methods of analysis using simultaneous equations, and the advantages of this method become more marked as the symmetry of a structure decreases and the number of degrees of freedom increases.

Calculations were checked by model analysis with fairly satisfactory results.

2. Analysis of Fink Trussed Bents by Moment and Thurst Distribution.

D. H. Pletta and V. J. Vitagliano, *Virginia Polytechnic Institute.*

The analysis of multiple aisle trussed bents is rather time consuming when classical methods of least work are involved. This paper presents an analysis based on moment and thrust distribution in which the fixed end reactions, stiffness, and carry-over factors for the trusses are first calculated and these constants are then employed in a modified moment and thrust distribution procedure to analyze the structure. The effect of thrust cannot be neglected when analyzing trussed bents in which the truss itself is arched. The results by moment and thrust distribution were checked with those as determined by least work, and a very close correlation was obtained.

3. Experimental and Theoretical Aspects of Skewed Rigid Frame Bridges.

D. H. Pletta, V. G. Szebehely, and M. A. Garcia; *Virginia Polytechnic Institute.*

The theoretical investigations aiming to establish "exact" solutions for any boundary condition of the governing differential equation of skewed plates are presented. Two basically different methods of approach are described, and relative advantages and disadvantages are discussed. A general solution in form of undefined functions is obtained by the method of characteristics.

The experimental investigation is concerned principally with the solving of certain preliminary problems, which have presented themselves in conjunction with the construction of a 1/10 scale model bridge. Notably, these problems are the effect of scale variation on

stress-load ratios, modulus of elasticity and Poisson's ratio, and the design of reaction dynamometers to measure the variation of reaction components along the hinged footing.

4. Approximate Matrix Analysis of Two-Dimensional Structural Frames.

W. P. Murden, Jr.; *Virginia Polytechnic Institute.*

In the *Transactions of The American Society of Civil Engineers,* Vol. 112, 1947, S. U. Benscoter presented a routine for the analysis of continuous beams on non-settling supports, using matrix methods. The present paper investigates the practicality of extending these matrix methods to the analysis of two-dimensional frames.

Both the one-dimensional and two-dimensional problems involve determining the reciprocal of a square matrix, the "stiffness matrix", the order of which is equal to the number of rotating joints, if joint translation is neglected. In the one-dimensional problem, the stiffness matrix is a continuant matrix, the reciprocal of which may be rapidly calculated. Such is not the case in the two-dimensional problem; therefore, approximation of the reciprocal matrix is necessary to permit reasonable rapid solution. This paper investigates the accuracy of solutions obtained with approximate reciprocals.

5. The Improved Hydraulic Analogy.

V. G. Szebehely and L. F. Whicker; *Virginia Polytechnic Institute.*

The realm of high Mach numbers can be obtained in a fluid flow by use of an improved hydraulic analogy, presented in the paper. The analogy is an exact method by which aerodynamic bodies can be tested in a low velocity water channel and the results correlated with those obtained in a high speed wind tunnel. The analogy is applicable to both subsonic and supersonic flow, but greatest use of it can be made in the supersonic range.

By use of the presented analogy, it is no longer necessary to assume a "hydraulic gas" with $Y = \frac{c_p}{c_v} = 2$. The $y = 1.4$ value for air can be obtained by using a parabolic channel and $y = 1.5$ by use of a triangular channel. A mathematical proof, along with experimental verification is offered. Several photographs are presented which show a very close correlation between theoretical and experimental results.

6. The Use of Sterographic Photography to Determine the Roughness Factor Coefficient in Fluid Flow Measurements (with Three-Dimensional Color Slides).

R. H. Tice; *U. S. Geological Survey.*

Stereo-photography has increased the accuracy of Flood-flow dedeterminations in the past few years. The factors needed in Flood-flow determination can all be measured in the field except for the channel roughness coefficient. The selection of this coefficient requires much experience and sound judgment in a very specialized field of hydraulics. Now with stereo-photographs, realistic pictures of channels with known coefficients can be compared with the channel for which the coefficient is desired.

Three-dimensional color slides of channels with verified coefficients will be shown along with slides of Virginia streams for which the channel roughness coefficient was needed.

7. Investigation of the Motion of a Sphere in a Semi-Infinite Fluid.

V. G. Szebehely and S. M. Gay, Jr.; *Virginia Polytechnic Institute.*

The governing equation of motion of fluid sphere (air bubble) rising normal to the surface in a viscous liquid is presented and the solution is established for six special cases. The effects of the viscosity, bubble weight, buoyant force, virtual mass, and surface are investigated separately and in combination. A numerical example is given in each case.

It is shown that the bubble weight and surface effect may be neglected for all practical considerations while neglecting the viscosity results in a large error. If the virtual mass is neglected, an abnormal value for the initial acceleration is found.

8. Influence of the Second Coefficient of Viscosity.

V. G. Szebehely, *Virginia Polytechnic Institute.*

If in viscous flow problems the effect of compressibility cannot be neglected, the flow cannot be described by means of a simple viscosity coefficient. By including the "second viscosity coefficient" in the investigations, a rather involved equation is derived in the paper which is applicable to steady flow problems. As basic equations, the generalized Navier-Poisson-Duhem equations, the continuity equation and the equation of state are used; the latter, due to its special form, is applicable to liquids only. The derived equation is applicable for problems where large compressibility as well as viscous effects are present, such as high-speed underwater objects and underwater explosion problems.

9. New Analogy for Investigating Compressible Flow Phenomena.

V. G. Szebehely, and O. G. Barnes, Jr.; *Virginia Polytechnic Institute.*

A development of the analogy between shear stress in a twisted member and an inflated soap membrance is presented and applied to the investigation of two dimensional subsonic compressible flow problems.

The differential equation of a non-pressurized soap membrance and the basic differential equation of steady, two dimensional potential flow of an inviscid, compressible fluid, are presented; and the limitations of the existence of an exact analogy are shown.

Theoretical and experimental results with a description of the test apparatus and test methods accompany the presentation.

10. Alkali Reaction of Concrete Structures in Virginia.

P. L. Melville; *Virginia Council of Highway Investigation and Research.*

Chemical reaction between certain siliceous compounds found in mineral aggregates and alkalies in Portland cement has been found responsible for a disintegration of concrete in structures. The reaction has been studied for a number of years in California by T. E. Stanton

and in other mid- and farwestern states. It was observed as far back as 1922 in the Buck Dam on the New River (Carroll County) in Virginia, but little attention has been paid to the possibility that the poor performance of certain concrete structures in the Commonwealth may result from the same cause. The reaction has been tentatively identified in several highway bridges scattered through Virginia and has been recognized in the James River Bridge in Buchanan (Botetourt County). The symptoms are as follows: wide but shallow random cracks of mass concrete, exudations of white to yellow siliceous gel, white to yellow splotches, large volumetric expansion, and lifeless appearance of the concrete. Aggregates which are potential reactors are opal, chalcedony, some siliceous limestones, some siliceous gravels, phyllite, and some cherts. The expansive reaction may be limited by reducing the total alkali (NaOH + KOH) in the cement to less than 0.6%. Since no cure is known, preventive measures appear important to protect concrete structures in Virginia.

11. The Measurement of Moisture Content in Concrete.

R. W. Czban, *University of Virginia.*

The performance of concrete as it ages depends in a large extent upon the curing treatment given it the first few weeks after pouring. Curing concrete consists of furnishing an adequate supply of water for the proper hydration of the cement. This affects not only the strength and watertightness of the concrete but also its resistance to freezing and thawing. As the curing treatment is critical, the Highway Department is interested in comparing the effectiveness of the various methods now employed.

By means of electrical resistance units embedded in test cylinders a set of calibration curves were obtained. Three types of moisture units used for soils were investigated; they were the Berkley, the Bouyoucos Nylon, and the Bouyoucos Plaster Block units. Only the plaster block units gave satisfactory results. The curves show the percentage of free moisture present in concrete as a function of the resistance and temperature. It is believed that calibration curves can be developed that will be valid for any type concrete. The curves will be used to compare various curing treatments. The equipment used in the investigation consists of a compact A. C. Ohm-meter and a Western Galvanometer, making it an ideal method for field investigations.

12. The Installation of a Meteorological Research Station at the University of Virginia.

R. E. L. Gildea; *University of Virginia.*

A brief description of the installation and instrumentation of a meteorological research station. Purpose and use of data from station by cooperating agencies.

13. A Rational Approach to Waste Treatment Based on Studies of Biological Processes.

P. H. McGauhey and E. E. Thompson; *Virginia Polytechnic Institute.*

All complete treatment of municipal and industrial waste is inevitably a biological process. Little is known of these processes and much less is known about the organisms which actually carry on these processes. This lack of information has resulted in "cut and dried" methods of

design and operation of waste treatment plants. Considerable data have been compiled on the design and operation of treatment plants from actual operation. Changes have been made in treatment equipment which have been improvements but it is doubtful whether anyone actually knows the true reason for the improved conditions.

With these facts in mind and with the critical demand for sewage and industrial waste treatment plants, it seems that a more practical and understood method of design and operation is needed. It is believed that a method of design could be devised based on the studies of the biological processes and organisms involved in the treatment process. This paper presents a brief summary of the work accomplished, the work that is going on today, and the work that will have to be accomplished to obtain precision in modern waste treatment.

14. The Application of the Dropping Mercury Electrode to the Study of Respiration Rates of Microorganisms Associated with Waste Treatment.

P. H. McGauhey and L. G. Rich; *Virginia Polytechnic Institute.*

The role of individual species of microorganisms in the biological treatment of wastes may be evaluated by a study of their respiration rates in the presence of these wastes. Most current respiration studies have been carried out with the Warburg respirometer, an apparatus which measures directly the reduction of the partial pressure of oxygen over a suspension of respiring micro-organisms. Because such equipment is quite expensive and limited to work of this nature, the author has endeavored to adapt to the same purpose the dropping mercury electrode, which is a somewhat less expensive apparatus having a wide use in routine analytical work in the laboratory as well.

The use of the dropping mercury electrode involves the measurement of the reduction in dissolved oxygen within the suspension of microorganisms. The required apparatus is comprised of a continual flow of mercury drops as the cathode, a quiet mercury pool as the anode, and an electrical circuit capable of measuring the current when a potential is established between the electrodes. Since the amount of current is directly proportional to the amount of dissolved oxygen present in the solutions in which the electrodes are immersed, periodic readings of the current flow will determine the rate of oxygen respiration of whatever microorganism may be present.

15. The Manometric B.O.D. of Industrial Waste Utilizing High Concentrations of Microorganisms.

S. E. Ketner and P. H. Watkins, *Virginia Polytechnic Institute.*

The B.O.D. of several wastes was determined by measuring the oxygen uptake of high concentrations of bacteria in the presence of the waste. These determinations involved a modification of the resting cell technique used in conjunction with the direct Warburg method. The effects of waste concentration, bacterial concentration, bacterial culture age, and environmental temperature were studied.

The B.O.D. of sewage, blowdown liquor from a semichemical sulfite pulp mill, and mixtures of the two wastes was determined by manometric means in an average time of one hour. Comparable values with the standard B.O.D. were obtained for sewage; the manometric B.O.D. obtained was 413 ppm, while the standard five-day B.O.D. was 495 ppm. The manometric B.O.D. of the blowdown liquor was 13,760 ppm, while

the standard five-day B.O.D. was 37,800 ppm. The manometric B.O.D. of a 1:1 by volume mixture of sewage and blowdown liquor was 9,900 ppm. while the standard five-day B.O.D. was 31,200 ppm.

The manometric values of the B.O.D. were found to be independent of bacterial concentration from 1.7 to 8.5 milligrams of dry bacterial cells per milliliter of suspension, independent of concentration of blowdown liquor at volumetric dilutions from 1:125 to 1:1000, and independent of culture ages from 24 to 48 hours.

MINUTES OF ENGINEERING SECTION BUSINESS MEETING

The business meeting of the Engineering Section was held at 3:58 PM on May 11, 1951, with 18 members present and Dr. R. E. L. Gildea presiding. The minutes of the previous meeting as recorded in the Proceedings of the Academy were read.

Dr. Nelson Murphy reported discussions which had been held in the Council meetings of the Academy. Dr. Murphy further pointed out that all members present could help the Section by requesting and soliciting papers for the 1952 meeting.

Mr. Melville moved that the Engineering Section request that the Council of the Academy recognize equally all academic degrees, especially as regards the May Proceedings of the Academy. Dr. Vilbrandt seconded the motion which was passed unanimously by the Section.

Dr. Gildea reported on the budget and asked for discussion concerning papers from non-members. No objection was voiced concerning papers from persons who are not members.

The Nominating Committee, consisting of Dr. D. H. Pletta, Chairman, Mr. Don Wallace, and Mr. Phillip Melville, reported as follows: Mr. B. A. Niemeier, Chairman; Dr. V. G. Szebehely, Secretary; and Dr. Nelson F. Murphy, Section Editor.

Dr. Murphy moved that the report of the Nominating Committee be accepted. The Chairman, Dr. Gildea, requested further nominations from the floor. There being none, a motion that the nominations be closed was accepted, unanimously electing the officers of the Engineering Section as outlined on the slate provided by the Nominating Committee.

Adjournment followed motions by Mr. Phillip Melville, *et al.*, expressing thanks to the Chairman for an excellent meeting.

16. Ultrasonic Coagulation of Phosphate Tailing - Part II.

Dudley Thompson; *Virginia Polytechnic Institute.*

Phosphate tailing samples were subjected to an ultrasonic field, varying from 400 to 1500 kilocycles and with an apparent power density ranging from 0 to 219 watts per square centimeter, to ascertain the effect on the rate of coagulation and settling of the solids in the tailing suspension.

A 4.46-per cent suspension, dispersed with 1.0 gram of sodium hydroxide and subsequently flocculated by the addition of 2.5 grams of gypsum per kilogram of solids, was subjected to an ultrasonic field of 400

kilocycles and a power density of 1.66 watts per square centimeter. Solids settled from 20 to 14 centimeters in approximately one hour and a quarter. An identical sample, not subjected to an ultrasonic field, required approximately 22 hours to settle this same distance. At the end of the first hour a maximum settling rate of 5.7 centimeters per hour was attained at a height of 16.5 centimeters by the insonated sample while the maximum rate of 1.0 centimeters by the insonated sample while the maximum rate of 1.0 centimeters per hour was attained at the end of the first hour by the control at a height of 19.0 centimeters. Under these conditions the ultrasonic field produced a 500 per cent increase in the initial settling rate of the phosphate tailing solids.

17. Development Studies on the Production of Sodium Trichloroacetic Acid Herbicide.

F. C. Vilbrandt and W. V. Brown; *Virginia Polytechnic Institute.*

The experimental work on the production of trichloroacetic acid from acetic acid and chlorine involved the chlorination of glacial acetic acid in the presence of red phosphorus, utilizing glass reactors of liter capacity, reaction temperatures of from 68 to 320°F, atmospheric pressures, liquid phase, excess chlorine; and a semi-batch process in the absence of actinic light.

Trichloroacetic acid was produced in an 82 per cent concentration, a 63.5 per cent yield, in a reaction time of 90 hours, and utilizing 68 to 250 per cent excess chlorine.

Improper chlorine distribution, incomplete condensation of vaporized intermediate and final products from the gases leaving the chlorinator and pyrogenation of trichloroacetic acid were found to affect a yield reduction. Appreciable pyrogenation does not occur in liquid phase chlorination below 320°F.

18. Elimination of Insect Contamination from Bread Corn.

N. F. Murphy and C. L. Kingrea; *Virginia Polytechnic Institute.*

Corn millers who produce meal for human consumption have difficulty in manufacturing a product that is free from insect contamination. This contamination consisting of insect parts, eggs, and larvae is counted microscopically and is recorded as fragments per 50 gram sample.

The major source of contamination is due to live insect infestation while the corn is in some phase of storage. The rice weevil is the primary insect infesting corn in the South, although other grain insects may be a problem, particularly in an infested processing mill.

The method of control most used at present has been the fumigation of large bins of grain with volatile organic liquid fumigants such as carbon disulphide - carbon tetrachloride, ethylene dichloride - carbon tetrachloride, and ethylene bromide - carbon tetrachloride mixtures. Hydrogen cyanide, methyl bromide, and chloropicrin are used for space fumigation of the mill buildings and equipment.

During the milling process, infestation can be killed in the grain by the "Entoleter" centrifugal impact machine. Infrared and dielectric heating have also received consideration for insect killing.

A continuous program of rapid fumigation in a nearly saturated atmosphere has given very good results in killing insects in laboratory tests. Equipment suitable for applying this method on a commercial scale can be constructed easily by modifying commercial vapor degreasing equipment.

19. The Determination of the Bed-Wall Coefficient of Heat Transfer in an Externally Heated Fluidized Bed.

F. W. Bull, H. R. Sanders, and R. C. Peterson; *Virginia Polytechnic Institute.*

The heat transfer coefficients to a fixed fluidized bed were determined in a steel reactor 3 inches in diameter. The beds was 29 inches high at minimum voidage and consisted of rounded Ottawa sand (20/30 mesh) fluidized by air. Heat transfer data were obtained at outer wall temperatures of 200, 400, and 600 °F., at mass superficial air velocities of 82.5, 123.2, 170.3, and 217.5 pounds per hour-square foot.

The coefficients ranged from 1.62 to 14.52 Btu/hr-sq ft-°F, with the higher values occurring at 400 °F and intermediate air velocities. These coefficients were from 1.2 to 6.5 times the coefficients found at corresponding bed wall temperatures with no solids present in the reactor.

20. Heat Transfer from Vertical Finned Tubes to Boiling Organic Liquids.

O. E. Tarbell and R. M. Hubbard; *University of Virginia.*

Apparatus for measuring the heat transfer coefficient from a vertical finned tube heater to boiling organic liquids is described. The factors affecting fine effectiveness are discussed, and a means of studying this property of finned heating surface is described.

21. Thermal Vs Catalytic Cracking in Standard Test Unit.

F. W. Bull and E. T. Ruehl; *Virginia Polytechnic Institute.*

A standard light East Texas gas oil was cracked in a vertical bench-scale fixed-bed catalyst activity test unit. Cracking was done at temperatures ranging from 500 to 1200 °F. over a Houdry pellet catalyst and over silica. From the data obtained a comparison of the cracking that occurred in the presence of a catalyst was possible. At approximately 1200 °F. the amount of cracking becomes the same for the catalytic and noncatalytic conditions.

22. A Study of a Freeze-Dryer by Determining the Maximum Vaporizer Temperature for the Freeze-Drying of Karo Syrup, Rabbit Serum, and Rabbit Plasma.

J. Maziuk and P. H. Watkins; *Virginia Polytechnic Institute.*

A study of a laboratory freeze-dryer was made by determining the maximum vaporizer temperature for the freeze-drying of Karo syrup, rabbit serum, and rabbit plasma. The material being lyophilized was contained in a 250-milliliter centrifuge bottle. The samples were mechanically shelled at 43 rpm in a dry ice-acetone bath. Heat for drying was supplied either from the surrounding air or from a constant temperature water bath. Vacuum ranged from 100 to 250 microns.

The effect of temperature of vaporizer surroundings was studied. Karo was not dried because of melting when either water bath or surrounding air was used as the heat source. The maximum bath temperature used for the drying of the serum and plasma was + 43 °C, the limit of the apparatus used. Twenty-milliliter samples of serum and plasma were dried using surrounding heat to 7.75 and 7.83 per cent moisture on a dry basis in 90 minutes drying time. Drying using water bath heat at 17 °C produced a sample of 11.6 per cent moisture in 30 minutes drying time. The usual constant rate and falling rate periods were observed,

but water bath heating eliminated the constant rate period within 5 minutes of the start of test. The data obtained were correlated by graphical means. Bath heating produced more flash vaporization and a dried product which appeared to be case-hardened. The product from surrounding heating was fluffy and porous.

23. Catalyst's Evaluations for Hydrogenation of Midlothian Coal.

R. G. Harmon, L. D. Jordan, and F. W. Bull; *Virginia Polytechnic Institute.*

Data were obtained on the percent liquifaction of Midlothian coal using tin, zinc, and Bayermasse catalyst. The initial hydrogen pressures were 1100, 1800, and 2000 pounds per square inch, gage, and the temperature of hydrogenation was 385 °C. Using the tin and zinc catalysts, a weight ratio of catalyst to coal of 1:100 was utilized. A weight ratio of 5:100 was used in the care of the Bayermasse catalyst. The ratios of vehicle to coal were 40 ml: 40 grams, and 80 ml.: 20 grams respectively.

24. Solubilities in the System Sodium Sulfate-Isopropanol-Water.

W. B. Blakey, L. R. Powers and O. L. Updike; *E. I. duPont de Nemours, Wilmington, Delaware; Carbide & Carbon Chemicals Division, Oak Ridge, Tenn.; University of Virginia.*

Solubilities of sodium sulfate in mixtures of isopropanol and water at temperatures of 30° and 40°C. were determined and are presented as triangular phase diagrams. Methods employed were principally cloud point determinations and direct analysis of solutions. Feasibility of a process to dehydrate sodium sulfate by salting out aqueous solutions with isopropanol was found to depend on highly efficient isopropanol recovery.

25. A New Chemical Coating for Aluminum.

N. F. Murphy, R. L. Scott, and T. Y. Chao; *Virginia Polytechnic Institute.*

Aluminum metal has found increasing use in the chemical industry because of its light weight and resistance to corrosion by many chemicals.

Nature provides aluminum with an adequate protective oxide coating for many conditions to which aluminum might be submitted. Methods have been developed that help build up oxide coatings and for electrodepositing other metals on to aluminum for increased protection from corrosion.

A method of forming a new coating on aluminum is presented. This black coating may be formed on an aluminum surface by dipping the metal into a molten mixture of sodium lithium borate or may be electrodeposited onto other metals by electrolysis in a mixture of aluminum phosphate in the molten sodium lithium borate. The film shows resistance to solution by all the mineral acids, the alkali hydroxides, salt water, hot and cold tap water, many organic reagents and molten salts. The film is flexible, adherent and non-reflective.

Minutes of the Section of Geology [8]

ALLEN SINNOTT, *Chairman*
WILLIAM H. BROWN, *Vice-Chairman*
WILLIAM T. PARROTT, *Secretary*
BYRON N. COOPER, *Section Editor* (1953)

FRIDAY, MAY 11, 9:00 A. M. — BIOLOGICAL LABORATORY

1. The Results of Recent Investigations of Emery Deposits in Virginia.[1]

A. A. Pegau, *Virginia Geological Survey;* Gerald M. Friedman, *University of Cincinnati.* (Presented by G. M. Friedman.)

Emery is a naturally occurring mixture of corundum and magnetite, and may also include spinel and ilmenite.

The emery deposits are located in the north-central part of Pittsylvania County about 40 miles south of Lynchburg and 20 miles north of Danville.

The emery occurs in irregularly shaped bodies, the largest of which are about 6 to 8 feet wide and 130 feet long. They have a steep northeast to vertical dip and an average strike of 65 degrees east of north.

The emery bodies are considered to be replacements of a basic rock (gabbro) near its contact with the schist. The volatile constituents, chiefly water, from the consolidation of the aplites and pegmatites related to the Leatherwood granite which intruded the gabbro, reacted with the primary minerals of the latter. Hornblende as well as iron, magnesium and aluminum oxides were formed as a result of this reaction. The latter were carried to the outer border of the basic rock by the escaping solutions where they gave rise to the minerals making up the emery. Some of the oxides crystallized along the route of the solutions to form accessory spinel and magnetite. Those oxides that passed into the adjoining schist reacted with the quartz to form sillimanite, andalusite and corderite, or were deposited as magnetite. Slightly later titanium bearing emanations reacted with the spinel to form hoegbomite.

2. Application of Luminescence Phenomena in Mineralogy and Petrology.

William P. Shulhof; *University of Virginia.*

The term luminescence refers to all non-thermal radiation emitted from a body in which electrons, excited by an addition of energy, lose this energy and return to stable positions of its lattice framework.

In the past, fluorescence, a division of luminescence, has been used in studying certain economically important ores. Now, luminescence properties, stimulated by ultra-violet rays, x-rays, cathode rays, and others, are being used in studying mineral constituents of rocks; by correlation determine the peculiar position of certain rock types; and many other similar uses.

Recent work in mineralogy on the mineral hackmanite indicates that this mineral's color reversibility is due to the arrangement of cer-

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tain impurities lodged within the lattice-like framework of the mineral when the specimen is exposed to energy stimuli such as ultra-violet rays, X-rays, cool daylight, and heat radiation. These impurities are thought to be responsible also for hackmanite's fluorescence properties. The fluorescence and color reversibility seem to be intricately connected.

Properties possessed by hackmanite indicate that this mineral is a *naturally occurring scotophor.*

3. Ordovician Bioherm in Roanoke Valley, Virginia.

F. D. Etheredge, Frank G. Lesure, and Harry W. Page: *Virginia Polytechnic Institute.* (Presented by Frank G. Lesure; Introduced by Byron Cooper.)

This paper reports on the detailed mapping of a Middle Ordovician bioherm in the valley of the North Fork of Roanoke River, Montgomery County, Virginia. Plane table and alidade were used to map the topography and geology in the general vicinity of the bioherm. Thin sections of the various related reef facies have been studied, and extensive study of the unusual faunal development within the bioherm are underway.

The reef is a highly fossiliferous lenticular mass consisting of two principal lithotopes: a fine-grained blue-gray biochemical limestone, the other a coarsely clastic calcarenite. The bioherm pinches out abruptly about 6 miles north of Lusters Gate, has a lateral extent of about 3,000 feet, and attains a maximum thickness of about 325 feet. The north end of the reef pinches down to a narrow tongue of calcarenite which persists as far as the Roanoke-Montgomery County Line.

Locally, the coarse calcarenite facies extends down to the top of the Knox dolomite and supplants the impure cherty limestones of the Lincolnshire and Whistle Creek. The early Edinburg age of the main part of the bioherm is indicated by included tongues of Botetourt limestone. Liberty Hall calcareous black shale overlies the reef.

4. Age Relations of the Lincolnshire, Whistle Creek and Associated Limestones in Western Virginia.

Byron N. Cooper; *Virginia Polytechnic Institute.*

Recent studies indicate that the most nearly complete succession of pre-Edinburg formations in the Appalachian Valley is located in the belt of outcrop along the northwest base of Pearis Mountain in Roanoke Valley, Montgomery County, Virginia. Five formations are distinguishable comprising six characteristic lithotopes. Abrupt facies variations are clearly evident. The sections are believed to clarify the age relations of the Lincolnshire and older Middle Ordovician limestones by demonstrating the true stratigraphic position of the Whistle Creek limestone. The sections also contribute considerable information concerning the possible Chazy age of the Whistle Creek and Lincolnshire formations.

5. A Preliminary Study of the Occurrence of Ground-Water in Crystalline Rocks of Albemarle County.[2]

Alfred C. Walker; *Virginia Geological Survey.*

Due to the relatively small yields of water obtained from the crystalline rocks, no investigations dealing primarily with this subject have been made previously in Albemarle or surrounding counties. The chief purpose of this study is to collect such information as may be available

[2] Published with the permission of the State Geologist of Virginia

on drilled wells, yields and quality of water obtained in such in the prevailing rock types, so that such information may be used as a basis in answering questions received by the State Geological Survey relating to ground water possibilities in different parts of the County.

Brief discussions are given of the various rock types and their ground-water characteristics.

More detailed work is now in progress.

6. Evidences of Crustal Megashearing in Virginia.

B. Ashton Keith; Director, *The Institute of Sciences, Washington, D. C.*

Since our 1936 discovery of series of long zones of in-line indications of crustal penetration, now authoritatively recognized as megashears,[3] many confirmative data have come from geophysicists and from the records of seismology. The present aim is to call attention to the records of some of the more significant movements that have occurred in the long row of crustal blocks (between Megs. 20 and 21) which flanks the eastern side of the Blue Ridge Mountains. From the records it will be seen that this zone is the third most active area east of the Rocky Mountains.

This paper includes a brief statement on the nature of crustal megashearing, the process by which many giant crustal blocks already have become clearly delineated. It states also, the methods employed in tracing and mapping these mega-structures from the evidences of Geology. Slides show the general locations and trends of several of these zones in the Atlantic States.

7. Major Structural Features in the Lynchburg Quadrangle, Virginia.[4]

William R. Brown; *University of Kentucky.*

Parts of three large structural units are included in the Lynchburg quadrangle. These are, from northwest to southeast, (1) the Blue Ridge-Catoctin Mountain anticlinorium, (2) the James River synclinorium, and (3) the Sherwill anticline. Areally, these may be considered to be separated one from another by the Martic surface, or "Martic thrust", exposed on the two limbs of the synclinorium. Evidence has been found which suggests that this surface is not a major fault.

Granodiorite of the core of the anticlinorium crops out in the northwest corner of the quadrangle. It grades southeastward into Lovingston quartz monzonite gneiss, which in turn grades into Reusens migmatite, a complex of Lovingston and dark hornblendic gneisses. The granodiorite and Lovingston gneiss may have been formed during one period of igneous invasion and granitiaation, the granodiorite representing an inner zone and the Lovingston an outer gneiss phase. The dark gneisses appear to be intruded by the Lovingston and may represent remants of older rocks invaded and grantized. Lynchburg gneiss, with Rockfish conglomerate at its base, rests unconformably upon Reusens migmatite. Three sizable anticlines have been delineated in the belt of Lynchburg.

Along the Martic line which trends northeastward through the middle of the quadrangle, Lynchburg gneiss and greenstones dip be-

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3 See Bull. Geol. Soc. of Amer. (Abstracts Sec. E.) for 1939. Also consult index of Dec. issues for 1938, 1940 and 1941.
Also Trans. Kansas Acad. of Sci. Vol. 42, pp 341-343. (1939)
Also Proc. Missouri Acad. of Sci. Columbia Meeting. (1940)
Also The Oil Weekly, Houston, Texas, p. 24. (Dec. 21, 1942.)

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neath Candler phyllite of the synclinorium. Above the Candler in sequence are Joshua schist, Arch Marble, Sixmile schist, Mt. Athos formation, and Slippery Creek greenstone volcanics. This chronologic sequence has been established primarily by structural relations. Thrust faults have produced an imbricate structure in the synclinorium.

On the southeast side of the synclinorium the Martic surface again emerges, and greenstones and Lynchburg gneiss, forming the northwest flank of the Sherwill anticline, are exposed. If these greenstones are extrusives, they are older than the Slippery Creek volcanics and may be correlative with the Catoctin.

8. Some Injurious Minerals in Highway Aggregate.

William T. Parrott; *Virginia Department of Highways.*

Within the past several decades, serious failures in highway pavements and structures resulted in a petrographic study of the mineral constituents of the aggregate.

It has been determined that some of the detrimental minerals in highway aggregate are chert, opal, jasper, gypsum, anhydrite, chlorite, pyrite, mica (in large amounts), and diabantite. The injurious action of these minerals is revealed in scaling, pop-outs and blow-ups of concrete aggregate, stripping or lack of adhesion when used with bituminous mixes and breakup of the road surface due to the instability of the chlorite under bituminous seals.

9. A Contribution to the Geochemistry of the Lead and Zinc Ores in the Timberville Area, Virginia.

Jack Green; *Columbia University.*

The lead and zinc ores of the upper Beekmantown formation in the Timberville area, Virginia, occur in three roughly parallel northeast trending belts. Quantitative spectroscopic data on the minor elements present in the sphalerite from the central and western belts offers some evidence as to the temperature conditions prevailing during ore precipitation. The preference for the ore localization in the dolomitic limestone is believed to rest on a physical basis. The clay mineral associated with the deposits in the central belt is identified on the basis of differential thermal analysis curve and X-ray powder diffraction data.

Replacement phenomena are shown by thin secion microphotographs. The deposits are believed to have originated in a dolomitic environment by the interaction of meteoric water and hydrothermal vaporous emanations.

10. Lithologic Variations in the Limestones West of Lexington, Virginia.

Allen Horowitz; *Washington and Lee University.*

Samples were collected from the Botetourt (Whitesburg), Lincolnshire (Holston), Whistle Creek (Lenoir), and New Market (Mosheim) limestones for comparison with geologic sections from Buffalo Creek, Collierstown, Virginia and Whistle Creek, Virginia. All samples within formation boundaries exhibited the same general characteristics except those within the Lincolnshire (Holston). The Lincolnshire (Holston) shows considerable local variation with no discernable pattern. Samples were grouped on the basis of their megascopic properties. Two areas of the Edinburg formation (Whitesburg and Athens) unmapped by Charles

Butts on his Valley of Virginia map were delineated. Dark homogenous limestone lenses which occur along Whistle Creek within the Botetourt (Whitesburg) are described.

11. Mineralogical Studies of the Sediments of the Slate River. Buckingham County, Virginia.

W. R. Oref and J. A. Parker; *Washington and Lee University.* (Presented by J. A. Parker.)

The purpose of this study was to determine if a correlation might be established between the sediments of the Slate River and the bedrock of the drainage basin of the stream. The Slate River is one of the minor tributaries of the James River in the western Piedmont of Virginia; it crosses schists, quartzites, slates and gabbros. In the stream sediments were found ilmenite, magnetic, zircon, leucoxcene, hornblende, epidote, muscovite, biotite, garnet, tourmaline, staurolite, rutile, chlorite, pyrite, kyanite, sillimanite and titanite. A correlation between the Arvonia Slate and the stream samples is noted when biotite, pyrite, and chloritic material are found in the Arvonia Slate samples and nowhere else. Garnet, rutile, kyanite, and sillimanite are found wholly within the Wissahicken Schist giving a second correlation.

12. Mineralogical Studies of the Sediments of the Rivanna River, Albemarle, Fluvanna, Greene, and Louisa Counties in Virginia.

A. S. Horowitz and T. S. Miller; *Washington and Lee University.* (Presented by A. S. Horowitz.)

Twenty-five compound samples were obtained from the sediments of the Rivanna River in an effort to make a correlation between the sediments and the bedrock traversed by this stream. The Rivanna River is one of the major tributaries of the James River in the western Piedmont, crossing mainly granites and metamorphic slates and quartzite, schists, and gneisses. The samples were divided into heavy and light fractions by the standard methods of separation, and the following minerals were found: ilmenite-magnetite, leucoxene, zircon, epidote, garnet, pyroxene-amphibole, muscovite, biotite, tourmaline, chlorite, rutile, staurolite, titanite, and kyanite. Certain trends were noted and offer a partial correlation between the formations and their sediments; however, a positive correlation between the parent rock and the stream sediments from the Rivanna River is rather difficult because the former exhibited too small a change in mineralogical composition to be of significant diagnostic value.

13. Petrography of Some Valley Dykes.

H. Cooke: *University of Virginia.*

In the Valley of Virginia there exist several types of igneous dykes which have been mapped and mineralogically described by previous workers in this field. Although the dykes are covered well in these papers, little or nothing has been said of the petrogenesis of the various dyke rocks.

The dyke rocks are named by previous workers and in some cases there was a need for renaming the rock.

This paper describes these dyke rock types mineralogically and seeks to divide them into two main types. These groups are the rocks associated with and related to a Quartz Gabbro, and those associated

with and related to an Olivine Basalt. Of this second group there are three types, and it is with these that this paper is concerned.

Several of the rock types studied were incorrectly named and correct names are suggested for the rocks known as Felsophyre or Granite Felsophyre and Nepheline Syenite. The random listing is then organized into a distinct grouping based on the similarities in mineral composition and structural relationship with some conclusions suggested in regard to their petrogenesis.

14. Some Recent Developments in Support of The Virginia Geological Survey.

Marcellus H. Stow; *Washington and Lee University.*

During the summer of 1950, the writer prepared a report on *The Mineral Industry and Mineral Resources of Virginia* for the Mining Committee of the Advisory Council on the Virginia Economy. The purpose of the report was to review the mineral industry of the State as it exists today and to call attention to the various specific factors that are retarding the development of the industry so that it is unable to make maximum contribution to the economic and cultural well-being of the citizens of the State. The report pointed out that Virginia has enormous reserves of coal and construction and ceramic materials, and important quantities of diatomite, kyanite, salt and gypsum, lead and zinc, and titanium minerals. The major drawback in the development of our mineral resources is inadequate financial support for the Virginia Geological Survey by the General Assembly. Certain critically needed programs and studies that should be carried on or supervised by the Geological Survey were discussed in detail.

The report recommended that the Advisory Council make a strong appeal to the Governor for increased budgetary allowances to the State Geological Survey, sufficient to put it on an adequate and effective basis as a source of information needed by private industry seeking to develop underground resources.

The press of the State received the report with commendation as is illustrated by the following editorial quotations:

From the Portsmouth *Star*: "One of the most interesting official documents released in recent months by any agency of the Commonwealth of Virginia is the report of the Committee on Mining of the Advisory Council on the Virginia Economy."

From the *Richmond Times-Dispatch*: "The Mining Committee makes out what appears—to the layman, at least—to be a good case for expansion of the work of the Virginia Geological Survey."

15. The Composition of the Euhedral Feldspar Crystals from the Catoctin Greenstone.

James L. Eades; *University of Virginia.*

An extensive study of the euhedral feldspar crysals found in many places in the Catoctin greenstone has been started by the Geology Department at the University of Virginia. Optical and X-ray methods gave different compositions for the same crystals. In view of work done by Alexander Kohler, O. F. Tuttle, and N. L. Bowen on high and low temperatures albites, it is believed the crystals are of high temperature origin.

16. A Study of the Industrial Coals of Logan County, West Virginia.

Robert S. Young; *University of Virginia.*

Coals of Kanawha (Upper Pottsville) and Allegheny age from Logan County, West Virginia were studied by X-ray methods. Through this study and the application of results obtained by earlier workers, certain crystalline impurities were identified and certain conclusions on the structure of coal were drawn. Kaolinite, quartz, calcite, pyrite, and dolomite are the dominant mineral impurities present in these coals. From the diffuse nature and position of the coal pattern halo, it appears that coal is made up of carbon of graphitic nature and very small particle size. General scattering appears to be due to hydrocarbons. The difference in the position of the halo in anthracite and bituminous patterns suggests that the particles in anthracite are larger than those of bituminous. A coordinated chemical and X-ray study, using evacuated cameras, is suggested for further research on the structure of coal.

17. Preliminary Re-Study of the Goose Creek Diabase.

D. S. Robertson; *University of Virginia.*

The Goose Creek Diabase is restudied in an attempt to trace mineralogic and chemical changes which took place during crystallization. Three rock phases are noted, a normal diabase, a pegmatoid diabase, and an albitic aplite. An augitic pyroxene crystallizes in the normal diabase, augite and pigeonite in the pegmatoid diabase. It is suggested that the albitic aplite is not a normal product of crystallization.

18. Some Features of Alaskan Geology - A Travelogue Made from Kodachrome Slides.

D. J. Cederstrom; *United States Geological Survey.* (Presented by title.)

19. The Background of Uniformitarian Geology.

Joseph K. Roberts; *University of Virginia.*

The fundamental concepts of uniformitarian geology were expressed towards the close of the eighteenth century in the writings of James Hutton (1726-1797), were elaborated upon by John Playfair (1748-1819), and given widespread publicity by Sir Charles Lyell (1797-1875). Immediately following Hutton's work, "The Theory of the Earth" published in 1788, he and his school of thought became known as Vulcanists or Plutonists in opposition to the Neptunists or the older school. The two outstanding teachers and scholars of the Neptunists of Hutton's time were Werner (1749-1817) and Cuvier (1773-1838,) who lived to see their doctrine on the decline.

More investigation afield, and more rational interpretation of cause and effect, as illustrated in nature, accelerated Uniformitarianism, but relegated the older doctrine to the status of historical significance. Though both mythological names are no longer extant, Uniformitarianism has come down through the years, open to amendments and improved interpretation in the light of ever expanding testimony in the rock record.

20. A Precambrian Fault Breccia in the Catoctin Formation in Virginia.

Wilbur A. Nelson and Robert S. Young; *University of Virginia.*
(Presented by Wilbur A. Nelson.)

A three to five foot cemented fault breccia in the Catocin formation, exposed along the Blue Ridge Parkway in Augusta County is described in detail. Breccia fragments are cemented by jasper.

21. Present Status of Topographic Mapping in Virginia.[6]

William M. McGill; *Virginia Geological Survey.*

A brief discussion of the present status of topographic mapping in Virginia, accompanied by maps and charts, illustrating the areas and proportionate percentages of the State covered by quadrangle maps of different scales and of different standards or grades of usefulness. The objective of the cooperative mapping program now in effect as a continuing project between the Federal and State Geological Surveys, is to complete the mapping of the entire State, on modern quadrangle maps of "high-accuracy" standards, on a scale of 1 inch equals 1 mile, with larger scale maps (1 inch equals 24,00 feet) for the larger municipal and industrial areas. The progress and success of the program depends upon (1) the active interest and support of all agencies, organizations and groups, using topographic maps, in the development of an expanded and coordinated overall State mapping program, and (2) increased appropriations to the State Geological Survey, on a continuing basis.

At the present time 64% of the State is covered by the earlier, and now obsolete, 30-minute quadrangle maps (29), on a scale of 1 inch equals 2 miles, and with a contour interval of 20 feet. Approximately 73% of the State is covered by 15-minute quadrangles (150) on a scale of 1 inch equals 1 mile, and with contour intervals of 20, 40, and 50 feet.

Of the 15-minute maps, 40 quadrangles (about 20% of the total area of the State) are modern maps (since 1938) on which culture is reasonably up-to-date; 20 quadrangles (about 10% of the total area of the State) are of relatively modern surveys (1930-1938), but cultural revision is necessary to bring them up to date; 77 quadrangles (38+% of the total area of the State) are maps of older surveys (1912-1930), and either extensive cultural revision or probably resurvey will be required; 13 quadrangles (6+% of the total area of the State) are maps of surveys made prior to 1912, and will require complete resurvey. Seven quadrangles (3½% of the total area of the State) are not covered by any topographic maps.

BUSINESS MEETING

Following the discussion of the last paper, announcements were made concerning the field trip and a brief business session was held. The two principal items of interest were first the nominations for new officers and an itinerary for the fall field trip. The nominating committee consisting of Charles Bass, A. A. Pegau, and W. B. Cormack, presented the following slate of officers: Chairman—William H. Brown; Vice-Chairman—Raymond S. Edmundson; Secretary—W. T. Parrott. There were no further nominations from the floor and the above mentioned candidates were unanimously elected. A further discussion took place

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regarding the place, time, and leader for the fall field trip. Professor W. A. Nelson of the University of Virginia offered to lead the group over sections of the Skyline Drive and along the eastern and western flanks of the Blue Ridge between Rts. 33 and 250 to observe the geological structure and stratigraphy of this section. The date of the trip was not set at the meeting, but will probably be in November. The Secretary was instructed to send out notices to the members regarding the date of the field trip. There being no further business, the meeting was adjourned at 4:15 P.M.

FIELD TRIP—MAY 12, 1951—8:15 A.M.

On Saturday morning, May 12, 35 members and guests of the Geological Section assembled at the north end of the highway bridge on Rt. 29 north of Lynchburg for a field trip under the leadership of Dr. W. B. Brown of the University of Kentucky assisted by Harvey Sunderman and William T. Harnsberger of the Virginia Geological Survey. A calvacade of some 15 cars was escorted by a city policeman from Lynchburg. This greatly facilitated the movement of the automobiles on the trip. The total length of the trip was some 42 miles and included 16 stops. At these stops time was given to inspect and collect samples from the exposures in the various formations of the Lynchburg Quadrangle. At these stops the stratigraphy and structure of the geology was discussed, and numerous friendly arguments took place. The group disbanded at Oxford Wayside on Rt. 460 at 4:10 P. M.

Minutes of the Section of Medical Sciences [9]

ERLING S. HEGRE, *Chairman*
DAN T. WATTS, *Secretary*
WILLIAM BICKERS, *Section Editor* (1953)

FRIDAY, MAY 11, 1951 — ROOM 22, MAIN BUILDING

1. The Effect of Pentobarbital, Morphine and Ether on the Blood Glucose of Rabbits.

D. T. Watts; *Department of Pharmacology, University of Virginia.*

The effect of morphine and pentobarbital on the hyperglycemia which occurs during surgical anesthesia in rabbits has been investigated. Results were as follows: Fifteen minutes surgical anesthesia increased blood glucose 48.7 mgm. per cent. Ten mgm./kgm. morphine sulfate gave an increase of 24.4 mgm. per cent; fifteen minutes anesthesia after this dose of morphine raised the blood sugar 65.1 mgm. per cent over the pre-morphine level. Doses of 5, 10, 15 and 30 mgm./kgm. of pentobarbital had no effect on blood glucose. Fifteen minutes surgical anesthesia after these doses of pentobarbital increased the blood glucose only 15.7, 13.1, 6.3 and 2.3 mgm. per cent respectively. These results show that the morphine and ether are synergistic in their effect on hyperglycemia whereas pentobarbital inhibits ether hyperglycemia. Most evidence indicates that ether hyperglycemia is due to the release of epinephrine through stimulation of the sympathico-adrenal system. Since this release of epinephrine depletes liver glycogen and tends to induce cardiac arrythmias during surgical anesthesia it would appear that barbiturates are safer preanesthetic agents than morphine.

2. Gross Composition of the Fat-Free Mammalian Body.

Grover C. Pitts; *Physiological Laboratory, University of Virginia.*

Several lines of indirect evidence indicate a constancy in gross composition of the fat-free body. The present work is a test of this constancy in the normal mammal. The mass of the fat-free body is estimated by two independent methods: (1) determination of body specific gravity by underwater weighing and (2) determination of total body water by the method of anti-pyrine dilution. The fat-free body mass is related to the mass of the following components: bone, skin, muscle and blood. Bone, skin, and muscle are determined by direct gravimetric methods on guinea pigs, and blood is determined on man by dilution of the dye T-1824. Results to date appear to support the predicted constancy. The blood component seems to be more satisfactorily expressed as a function of the fat-free body mass than as a function of total body weight or of body surface area.

3. The Effect of Cortisone on Wound Healing.

John Paul Carter, Edwin P. Lehman, J.F.A. McManus, E. Meredith Alrich, and James R. Cash; *Department of Surgery and Gynecology and Department of Pathology, University of Virginia Medical School.*

Clinical observation first indicated that cortisone might produce retardation of wound healing. The work of Ragen *et al* showed depression

of mesenchymal elements in healing wounds. In order to measure the amount of depression, tensile strength determinations were made upon rats treated with adrenalectomy. ACTH, and cortisone. Those treated with cortisone showed marked depression of the tensile strength curve. Histological and histochemical studies of these wounds revealed lack of maturation of fibroblasts, and haphazard proliferation of capillaries. Present studies are being undertaken to determine the specific site of action of cortisone.

4. Intimal Aortic Lipoid Following Cortisone and ACTH Therapy in Younger Age Groups.

Eugenia M. Etheridge and Cornelia Hoch-Ligeti; *Department of Pathology, University of Virginia Medical School.*

The observation of a very large amount of fat in the intima of the aorta of a child dying of leukemia, who had been treated with cortisone, has led to the study of the aorta in other young individuals treated with both cortisone, and ACTH. Random sections of aortas taken from jars of formalin-fixed autopsy material of thirty-three individuals from one to twenty years of age who had been treated with either cortisone or ACTH were compared with sections of aorta from suitable control groups of similar age. No significant differences were found in preparations stained with Weigert's elastica stain, or periodic acid-Schiff's reagent. Hematoxylin and eosin and Sudan IV stains, however, show a marked increase of lipoid in the intima and, in several instances, the media, in the age group one-eleven years treated with cortisone and ACTH. Schultz stains, in general, coincided with the Sudan IV. After eleven years of age the amount of fat in the intima of control cases approximated that of treated cases so closely that no significant difference in the two groups was seen. No definite correlation between the degree of change and the amount of hormone received could be establishd, but there does seem to be some relation to the duration of treatment. There is no definite difference between the effects of cortisone and ACTH.

5. Preliminary Observations on the Influence of Hormones on the Basal Body Temperature of Normal Young Adult Human Males.

Douglas E. Bragdon; *Department of Anatomy, University of Virginia Medical School.*

This study, which was prompted by the need for a better understanding of the mechanism of the mid-cycle rise in basal body temperature which occurs in the ovulatory menstrual cycle of women, was designed to provide information on two points: (1) the time interval between the injection of a single standard dose of progesterone and the onset of the ensuing thermal elevation, and (2) whether or not hormones with luteotrophic properties might have a thermogenic action. Eleven first year medical students from twenty-two to twenty-eight years of age were used as subjects. Our study has shown that the height of the response to a single standard dose of injected progesterone in oil varies from individual to individual as does the time interval between injection and onset of response. This interval has been found to be as short as twelve hours. Progesterone may not be the only hormone involved in producing this thermal rise. "A.P.L.," a human chorionic gonadotrophin caused a significant temperature rise in two out of three subjects. The one who did not respond had also been a hyporeactor to progesterone. Sheep pituitary luteotrophin has produced a rise in the one subject in which it has been tried. These findings, when extended, may

provide a basis for explaining the discrepancies which have been reported between ovulation time and the time of the basal temperature rise.

6. A Study of the Phosphate Turnover in the Human Erythrocyte.

D. R. H. Gourley; *Department of Pharmacology, University of Virginia Medical School.*

Using P^{32}-labeled phosphate to study the rate at which phosphate turns over in several acid-soluble organic phosphorus compounds of human erythrocytes *in vitro*, it has been found that the specific activity of the P in the fractions separated increases at different rates. The greatest phosphate turnover occurs in the labile P of adenosine triphosphate. The specific activity of the P of 2, 3-diphosphoglyceric acid also increases rapidly during the three-hour incubation period at 37°C. The incorporation of P^{32} into glucose-1-phosphate, the stable P of ATP and adenylic acid is less dramatic but easily demonstrated. Very little phosphate turnover during the experimental period is observed in glucose-6-phosphate, glycerophosphoric acid, propanediol phosphate or the coenzyme fraction. When sufficient sodium idoacetate is added to completely inhibit glycolysis, the formation of and the entry of P^{32} into diphosphoglyceric acid is blocked, the glycolytic regeneration of ATP ceases, and adenosine diphosphate appears in the cells. These observations are in accordance with the hypothesis that inorganic phosphate enters the cell by the formation on the membrane of an organic phosphorus compound such as ATP.

7. Sulphydryl Group Changes during Urease Action.

Henry E. Evert; *Dept. of Pharmacology, University of Virginia Medical School.*

The change in sulphydryl groups during the course of urease action has been followed by making concurrent determinations of SH groups and urease activity. The urease activity was determined by the direct Nesslerization method using a standard ammonium sulfate calibration curve. The method of Flesch and Kun (Proc. Soc. Expt. Biol. Med. 74:249:1950) was used to determine the change in SH during urease action. The red SH reagent, 1-(4-chloromercuriphenylazo)-naphthol-2 was synthesized from p-aminophenyl mercuric acetate (Eastman Kodak Co., Rochester, N. Y.) by diazotization and coupling of the diazonium salt with 2-naphthol in alkaline solution. The red SH reagent was standardized against glutathione. In control experiments, no apparent SH change was noted with urea, ammonium ion, phosphate buffer, sucrose, glycine, B.A.L. and thioglycolic acid. Reduced glutathione and cysteine SH responded. The total urea concentration was varied from 0-170/ug. in the reaction mixture. Total volume 10 ml., potassium phosphate buffer, 0.2 M, pH 7.18, temperature 40°C. For each given urea concentration, there occured an initial disappearance of SH followed by a steady state SH value. This initial SH group disappearance and steady state SH paralleled the urease activity. In a series of experiments with increased urea substrate concentrations, the steady state SH became progressively higher to a maximum value. Further increase in initial urea concentration resulted in a decrease of the steady state SH to a minimum value. The following mechanism was postulated: RSH + urea $\rightleftharpoons$ "activated complex" $\rightarrow$ RSH + products.

8. Preliminary Studies on the Effect of Hormones on the Electrolyte Pump in Frog Skin.

Ernst G. Huf and Irving Fritz; *Department of Physiology, Medical College of Virginia.*

It has been found that active uptake of NaCl by the epithelium of surviving frog skin depends strongly upon a sufficient amount of K^+ ions in the salt solutions which are in contact with the skin. Omission of k^+ from the solutions reduces active salt uptake. Rb^+ can almost completely, Cs^+ can partially, substitute for K^+, whereas NH_4^+ cannot do so; it inhibits active salt uptake. The close relationship between Na^+ and K^+ metabolism and Na^+ and K^+ movement in frog skin has raised the question, whether hormones act as regulators in frog skin in a way similar to the control of ion movements in the kidney. Twelve-hour "inside-out" skin bag experiments were run as described in an earlier abstract (Va. Acad Sc. Proc. 1949-1950, 389). Thyroxin or Eschatin (suprarenal cortex extract), when added to the salt solutions (the preservative was added in the controls) in relatively large doses as compared to therapeutical doses, showed no striking effects upon net chloride and water uptake. Pitressin (2 PU/5 ml.), when added to the salt solution of an "outside-out" bag, resulted in an increased uptake of salt and water by the skin. It is suggested that pitressin may have increased the permeability of the skin for water and that, because of an increased uptake of water by the bag, more salt is being pumped in also. The negative results with Eschatin are not conclusive as to the effect of hormones of the adrenal cortex on ion movement in the skin. Work with ACTH, DOCA, and cortone is in progress.

9. Observations on the Nicotinolytic Activity of Some Aralkyl Amines.

P. S. Larson, C. B. Van Slyke, J. K. Finnegan, and H. B. Haag; *Department of Pharmacology, Medical College of Virginia.*

Twelve compounds of the general formula (R^1, R^2, R^3) C—R^4—CH_2—CH (R^5) N (R^6, R^7) have been tested for nicotinolytic activity as judged by their ability to antagonize the pressor effect of nicotine on dogs. In order of decreasing potency, these compounds were as follows: 6-dimethylamino-4,4-diphenyl-3-heptanone [methadone]; N,N,1-trimethyl-3,3-diphenyl-4-hexenylamine; 2-(benzhydryloxy) triethylamine; N-methyl-N-(3,3-diphenyl-sec-butyl) butylamine; N-ethyl-1-methyl-3,3-diphenylpropylamine; N,N-dimethyl-3,3-diphenyl-sec-butylamine, 2-(benzhydrylmercapto)-N,N-dimethylethylamine, α-(benzhydrylmethyl)-N,N-dimethylbenzylamine, and 2-[p-chloro-α-(2-dimethylaminoethyl)benzyl] pyridine; 6-dimethylamino-4-phenyl-4-(3-pyridyl) -3-hexanone; N,N-dimethyl-3,3-diphenylpropylamine; 2-(benzhyryloxy) -N,N-dimethylamine [diphenhydramine]. The I. V. dose required to effect a fifty percent reduction in the pressor response to 0.02-0.03 mg./kg. nicotine given I. V. ranged from 0.5 mg./kg. for methadone to greater than 40 mg./kg. for diphenhydramine. The pressor response to epinephrine was potentiated by some compounds and somewhat reduced by others.

This study was made under a research grant from the American Tobacco Company. The compounds, excepting methadone, were kindly supplied by Parke, Davis and Company.

10. Mounting Brain Specimens in Plastic.

Louise L. Jones; *Department of Anatomy, Medical College of Virginia.*

This paper describes briefly the technique of fixing, slicing, staining and embedding brain specimens in clear plastic, for teaching and museum purposes.

The formalin-fixed brain is cut in slices of one-half centimeter and stored in 10% formalin. Each slice is processed through Mulligan's solution so that the white matter will take up little, if any, stain. Nigrosine in a 0.5% aqueous solution is used for staining the gray matter. Store in 10% formalin.

To prepare for embedding, air dry slice of brain until slightly discolored; place in 70% alcohol for several hours. After a second complete air drying, infiltrate in uncatalyzed liquid plastic in a covered container for four days.

A permanent container is prepared from sheet plastic which is cut and assembled with plastic cement to form a box of desired size, ½" thick and open on one ½" side.

Embed specimen in this box in suitable volume of plastic, to which 0.2% by volume of catalyst has been added, wedging it in with plastic blocks to prevent the specimen's floating. Trim block and polish.

11. The Trophoblast of a Young Human Embryo.

James E. Kindred; *University of Virginia.*

Data on the histology of a young human embryo are noe extensive. The present report is a description of the trophoblast of a young human embryo and surrounding endometrium. The material consists of the well-preserved trophoblast and adjacent uterine mucosa from uterine curettage of a woman with the following history: onset of last menstruation, February 10; coitus, February 22; hospitalization, February 26; curettage, February 28. The specimen was obtained through the courtesy of Dr. Arnold F. Strauss, pathologist, DePaul Hospital, Norfolk, Virginia, with a diagnosis of a young human chorion without embryo which according to the history should be six days old. The trophoblast surrounding the small chorionic cavity lies just under a thin layer of lining uterine epithelium. It is more deeply embedded in the uterine mucosa than is the trophoblast of the Hertig-Rock embryo of seven days, which is the youngest embryo yet described. The extent and disposition of the trophoblast resembles more closely that of the Hertig-Rock eleven-day embryo than it does that of the seven-day embryo. There is practically no necrosis. The cytotrophoblast cells are well preserved, and there is evidence of the origin of the mesoblast cells from the inner surface of this layer. Synctiotrophoblastic cells are just beginning to differentiate. Intratrophoblastic lacunae are beginning to form, and some of the peripheral lacunae are in continuity with eroded blood sinusoids. There is no edema, and the uterine stroma around the trophoblast shows the characteristics of the latter third of the menstrual cycle.

12. Embryonic Lens Induction in the Chick.

Morris S. McKeehan; *School of Anatomy, University of Virginia.*

The eye vesicle and lens ectoderm of chick embryos of ten to twenty-one somites adhere so strongly that they cannot be separated intact by dissection in the living. The lens reaction occurs within this contact area.

Between twelve and nineteen somites the normal lens reaction in the center of the adherent ectoderm is characterized by a loss of vacuolization in the cytoplasm, palisading of cells, marked reorientation of nuclei, and a twofold increase in cell number, the latter being effected apparently by a concentric contraction in the lens placode rather than by proliferation. During this period the cell volume remains approximately constant. The mechanism of invagination of the lens placode appears to be a local contraction in the terminal bar net at the outer ends of its columnar cells.

The changes characteristic of early lens induction in the normal site occurred in competent presumptive epidermis brought into intimate contact with the retina. The lens reaction did not occur in the portion of the lens placode whose contact with the retina was blocked with thin cellophane. Thus there are clear indications that lens induction both within and outside the normal site is mediated only by physical contact between retina and reacting ectoderm.

13. Motion Pictures of Tissue Reactions in Tadpoles to Implants of Inert and Active Foreign Substances.

Carl C. Speidel; *University of Virginia.*

Typical cell reactions to implants of inert and active foreign substances have been recorded by cine-photomicrography. A case history of an implant of human hair illustrates the characteristic tissue responses to an inert substance. The chief histological changes are presented over a period of from one to forty-five days after operation. Histories of implants of coarse magnesium powder reveal the characteristic tissue responses to a chemically active substance. Magnesium induces progressive tissue irritation as it reacts with water and becomes transformed into magnesium hydroxide and hydrogen. Selected cases show the microscopic changes over periods of from ten minutes to four months. These include the formation and elimination of gas bubbles, the mobilization of leukocytes, the process of encapsulation, and the production of large vesicles. Alternating increase and decrease in the size of the vesicles may take place from time to time. Magnesium fragments from airplanes, bombs, and flares are frequently involved in the wounds incurred by soldiers in modern warfare. Such wounds fail to heal properly. These motion pictures, therefore, are of some surgical interest.

14. Relationship between Blood Alcohol Levels and Acute Respiratory Failure.

Teresa Silverman, Sidney Kaye, and Harvey B. Haag; *Departments of Pharmocology & Legal Medicine, Medical College of Virginia.*

Incident to undertaking a study concerned with factors which might influence the sensitivity of the respiratory center to the depressing effect of alcohol, we have had occasion to determine such blood alcohol levels in dogs (average .57 gm.% ± .08, ranges from .40 to .68 gm.%) and mice (.83 gm.% ± .07, ranges from .69 to .92 gm.%). In addition, the cerebrospinal fluid levels of alcohol in dogs was determined at the time of respiratory failure (.64 gm.% ± .04). Haggard and Greenberg have previously found that the blood alcohol value causing acute respiratory failure in rats is .93 gm.% with ranges of .89 to 1.0%.

The terminal concentration of alcohol in the blood of a series of seventy-two humans diagnosed as dying from acute alcoholism has also been determined (average .42 gm.% ± .09, ranges from .26 to .60 gm.%).

Assuming that these deaths in man are due to respiratory failure, it then appears that the respiratory center in man is the most susceptible to alcohol depression, with that of the dog, mouse, and rat showing increased tolerance in the order given.

It is interesting to note that this susceptibility to alcohol for the various species follows closely their ability to tolerate anoxia.

15. Studies on the Effect of Alcohol on the Adrenal Glands of Rats.

J. C. Forbes and G. M. Duncan; *Division of Alcohol Studies and Rehabilitation, Department of Health, State of Va., and the Department of Biochemistry, Medical College of Virginia.*

Since recent work with patients suffering from acute alcoholism strongly suggests that there may be alterations in adrenal function in this condition, studies have been carried out on the effect of acute alcoholic intoxication on the vitamin C and cholesterol content of the adrenal glands of the albino rat. The results show that acute alcoholic intoxication acts similarly to other conditions of stress, such as cold, burns, and severe infection, in causing an acute drop in the level of both Vitamin C and cholesterol in the adrenals of this animal. The alcohol was given in a 50% solution by stomach tube, and the animals were sacrificed at intervals thereafter. Three dose levels based on the animal's body weight were tested, namely, 4.5 gm., 7 gm., and 9 gm. per kilogram. 4.5 gm. gave a mild intoxication with loss of coordination while 9 gm. resulted in unconsciousness and in some cases, death. The effect obtained with the 4.5 gm. dose, although definite, was not as great as with the higher doses. The latter showed an average reduction of about 50% in both the cholesterol and ascorbic acid as compared with the levels in the control animals. The maximum depletion in ascorbic acid usually occurred within three hours, that of cholesterol from five to seven hours, after the alcohol administration.

16. Comparison of Chloride and Thiocyanate Space for Various Organs, Especially of Muscle in Normal and Pathological Conditions.

E. Fisher, H. V. Skowlund, E. A. White, M. J. Bratton, and B. A. Chevalier; *Medical College of Virginia.*

A satisfactory method has been worked out to determine simultaneously chloride and thiocyanate space in small samples from organs (rabbit). For heart and normal skeletal muscles, thiocyanate space is constantly twenty to thirty percent higher than chloride space. For some other organs, e.g. the liver, thiocyanate space is about twice as large as chloride space, while for some organs, e.g. the brain, thiocyanate space is considerably smaller than chloride space. For most types of muscular atrophies, the normal ratio of thiocyanate to chloride space is little altered. In the presence of local edema, thiocyanate penetration into the extra-cellular space is considerably delayed.

The observed differences in the ratio of thiocyanate to chloride space are discussed in relation to the differences in the electrolyte content of the cell phases of the various tissues. The possibility of using the methods employed on human biopsy material is considered critically.

17. The Effect of Thyroxine on Ascorbic Acid Oxidation.

Chalmers L. Gemmill; *Department of Pharmacology, University of Virginia Medical School.*

After numerous negative experiments on the possible effect of

thyroxine on oxidation in animal tissue slices and homogenates, experiments were tried with this hormone on vegetable oxidases. It was found that small amounts of thyroxine stimulated the oxygen uptake of the ascorbic acid-ascorbic acid oxidase system. The purified preparation of ascorbic acid oxidase was obtained from squash. Thyroxine had no effect, however, on the oxidation of catachol by tyrosinase. Since ascorbic acid oxidase is a copper protein, the effect of thyroxine was studied on the copper ion induced oxidation of ascorbic acid. In this case, an inhibition of oxidation was obtained which was proportional to the thyroxine concentration.

18. Heat of the Enzymatic Inversion of Sucrose.

C. R. Bauer, C. L. Gemmill, M. J. Lover, F. C. Holler, and D. Venable; *Department of Pharmacology, University of Virginia Medical School.*

A year ago Holler, Venable, and Gemmill (Fed. Proc., 9:287:1950) reported that thermistors may be used in microcalorimetry. This work has been continued and extended, using both thermistors and thermopiles as thermometric elements in the determination of the heat produced during the enzymatic inversion of sucrose. The changes in resistance of the thermistors was measured by means of standard bridge circuit during reaction or calibration runs. When thermopiles were used, their output was amplified and then recorded with a Brown recorder. Calibrations of the calorimeters were made in the classical way and the calibrations were designed to reproduce very closely the same temperature changes as in the actual enzymatic reactions. Commercial invertase was used in these determinations which were carried out at 30°. A buffered (pH 4.5) 0.1297M sucrose solution was used, and the enzymatic reaction was stopped by the addition of a small amount of sodium hydroxide. Analyses for invert sugar in the final reaction mixtures were made by a standard gravimetric Fehling's procedure. The results of eight determinations with thermistors gave the heat of enzymatic inversion of sucrose (ΔH) as $-3.28 \pm .05$ kg. cal. per mole. Four determinations with thermopiles gave a value of $-3.32 \pm .06$ kg. cal. per mole.

19. Oxygen Administration to Patients with Pulmonary Fibrosis or Emphysema.

John L. Guerrant; *Department of Internal Medicine, University of Virginia Medical School.*

Report of a patient with pulmonary emphysema, cor pulmonale, cyanosis, and congestive heart failure who developed coma and died after oxygen administration: The development of coma after oxygen administration in patients with chronic lung disease and anoxemia has been reported by several authors. The mechanism is not well understood. Such patients may develop increased arterial oxygen saturation, increased arterial carbon dioxide tension, reduction in arterial blood pH, decrease in respiratory volume, increase in cerebral spinal fluid pressure. None of these changes alone will regularly produce coma. Patients with chronic anoxemia should be observed closely when treated with oxygen. Coma can be prevented by using low oxygen concentration and intermittent oxygen administration. Intermittent Positive Pressure Breathing is a useful procedure for these patients.

20. The Diagnosis of Brain Tumors with Diiodofluorescein Using a Crystal Counter and a Photoelectric Multiplier—Physical and Clinical Implications.

Kenneth Crispell, Alden Stephenson, and Frank Hereford; *Department of Internal Medicine and School of Physics, University of Virginia.* (Presented by title.)

21. Investigations on the Histochemical Demonstration of Carbohydrates by the PAS Method.

J. F. A. McManus and C. Hoch-Ligeti; *Department of Pathology, University of Virginia School of Medicine.*

This report describes the reinvestigation in tissue sections and in the test tube of the basic reactions involved in the periodic acid oxidation of 1,2 glycols and the subsequent demonstration of the polyaldehydes with Schiff's reagent.

1/2% aqueous periodic acid will not produce a precipitate with fresh Schiff's reagent except in proportions in excess of 1:5. The first compound formed between periodic acid and Schiff's reagent is soluble in excess of Schiff's reagent. In the presence of a small amunt of periodic acid Schiff's reagent is available to color aldehydes in tissue sections but no oxidizing effect of periodic acid can be demonstrated. For these reasons, sections need not be rinsed after periodic acid oxidation but may be taken directly to Schiff's reagent which acts like a reducing rinse.

Variations in the composition of Schiff's reagent may produce variable results, depending apparently upon the amount of excess hydrochloric or sulfurous acid. If an excess of substrate, capable of combining with sulfurous acid, is present in the spot test, periodic acid or periodate oxidation may recolor the Schiff's reagent. A large excess of Schiff's reagent seems to prevent this occurrence.

The possibility of substituted 1,2 glycols and ring structures being oxidized under the conditions of the PAS reaction should be considered in the light of known optima of time and pH for these oxidations. Practically, the PAS reaction shows 1,2 glycols, usually carbohydrate. This may be checked with the acetylation technique of McManus and Cason, further precautions and safeguards of which are described.

22. Cytologic Criteria of Malignancy: Critical Comments on the Morphologic Diagnoses of Neoplasia.

S. Miles Bouton, Jr.; *General Hospital, Lynchburg.*

The recent stressing of pure cytologic study of neoplasia necessitates re-evaluation of the criteria used by the histopathologist. Critical analysis of the approach to tissue study offers a reminder that carcinoma in tissue sections is not actually diagnosed entirely—occasionally not even primarily—by morphologic features of individual cells. Tissue relationships play a very important part. Several questions present themselves for answers: (1) Is there such a thing as a "malignant cell" as judged by cell appearance apart from other cells or tissue structure? (2) If there are any characteristics which all malignant cells reveal, do they occur only in neoplastic tissue? (3) What about type specificity of tumor cells as an index of a degree of malignancy? (4) In view of recent statistical experiences with the Papanicolaou technique, is it proper to consider as truly neoplastic a growth which regresses spontaneously? Behavior in tissue culture, survival in transplants, appearance of

metastatic cells as compared to primary growth, and response to x-irradiation in relation to degree of anaplasia, all enter into the advanced morphologic diagnosis of "cancer."

23. Isoimmunization by a New Blood Factor in Tumor Cells.

Philip Levine, O. B. Bobbit, R. K. Waller, and A. B. Kuhmichel; *Ortho Research Foundation, Raritan, N. J. University of Virginia Medical School, and Medical College of Virginia.* (Presented by title.)

24. Sakaguchi Tube Test for Arginine Applied to Histochemistry.

T. N. Warren and J. F. A. McManus; *Departments of Clinical Pathology and Pathology, University of Virginia Medical School.*

Sakaguchi's original test for arginine using a-naphthol was adapted to histochemical uses by Baker, Serra, and Thomas. These methods have the disadvantage of an unstable color. Recently Sakaguchi has developed another test, using 8-hydroxyquinoline (oxine) in place of a-naphthol. This paper reports preliminary studies in the application of this method to histochemistry. This new method has the advantage of a simplified procedure producing a more stable arginine color.

Formalin-fixed tissue is cut on the freezing microtome and attached to a slide. After partial air-drying, the slide in a horizontal position is flooded with the following reaction mixture: 9 drops 8-hydroxyquinoline (oxine) solution, 0.4% in absolute alcohol; 60 drops water: 60 drops 10% sodium hydroxide; and 8 drops sodium hypochlorite (Eimer and Amend). Tissues rich in arginine develop an orange color in two to five minutes. The reaction may be halted by draining the slide and mounting in glycerine. The color does not fade perceptibly in forty-eight hours.

A strong color is produced in the thymus of humans and rabbits, perhaps indicating a high arginine content of the histone in thymus nucleoprotein. Duodenum is strongly colored in the region of Brunner's glands, where apoferritin is presumably manufactured. Colloid in thyroid tissue also stains deeply. Collagenous tissue has a moderately high arginine content. Normal epithelial tissues generally produce very little color.

25. The Demonstration of the Intercapillary Space of the Human Renal Glomerulus.

J. F. A. McManus, C. H. Lupton, Jr., L. S. Graham, Jr.; *Department of Pathology, University of Virginia Medical School.*

The method of Ritter and Oleson ('50) combining the Hale ('46) procedure for acid polysaccharides and the periodic acid-Schiff's reagent method for carbohydrates has been applied to the study of human kidneys. A selective staining of the intercapillary space of the human renal glomerulus is obtained. The abnormal glomerular material of intercapillary glomerulosclerosis infiltrates and accentuates the intercapillary space. The method of Ritter and Oleson ('50) is a valuable histological stain for the study of the human kidney. Its histochemical specificity for acid polysaccharides is questioned.

26. Changes in the Blood and Peripheral Vascular Bed Produced by Experimental Metrazol Administration.

J. F. Kell, Jr., G. R. Hennigar, and E. C. Hoff; *Neurological Science Laboratory, Medical College of Virginia.*

Investigations of the influence of the brain's vasomoter centers have demonstrated that stimulation of the cat's cerebral pressor areas results in widespread vasoconstriction. However, in certain viscera, such as the lung, the vascular bed remains dilated. Metrazol, which stimulates only the suprasegmental vasomotor centers in both convulsive and subconvulsive injections, was administered chronically in a series of cats for a period of one to two months. Many of these animals revealed pronounced thickening of the pulmonary arteries and a pronounced increase in the red blood cell count. This pulmonary arteriosclerosis and polycythemia in cats resembles Ayerza's disease in man.

27. The Effect of Lactic Acid Production on In Vitro Acid Secretion from the Gastric Mucosa of a Bullfrog.

Leslie E. Edwards and Joyce A. Wills; *Department of Physiology, Medical College of Virginia.*

This is a method designed for getting pure gastric juice from a membrane obtained from the lining of animal stomachs. These membranes are capable of secreting a strong acid for a period of twenty-four hours. About 0.1N hydrochloric acid is produced by the bullfrog. This paper deals with the interpretation of free acid as measured in this juice.

It wes found that lactic acid does not influence the free acid measurements for these reasons: (1) the amount of lactate produced by the bullfrog stomach does not contribute appreciably to the acid secreted by the stomach; and (2) no direct relationship exists between the amount of free acid (HC1) and the lactate produced. The dissociation of lactic acid and the depression of ionization of lactic acid by other H ions were taken into account.

In addition, no relationship exists between the amount of pepsin and the free acid secreted.

Minutes of the Section of Psychology [10]

JOHN N. BUCK, *Chairman*
STANLEY B. WILLIAMS, *Secretary-Treasurer*
FRANK W. FINGER, *Executive Committeeman*
RICHARD H. HENNEMAN, *Section Editor* (1954)

FRIDAY, MAY 11, 9:00 A. M. — ROOM 16, MAIN BUILDING

1. The Incidence, Assigned Motives, and Successes of Attempted Suicides, in Certain Chinese Cities, with Comparative Intercultural Factors.

C. Hart Westbrook; *Richmond, Virginia.*

Data: A. 10,188 cases (attempts and successes), Greater Shanghai, 1929-34 (excluding 1932); B. Hospitals: Peking, 149; Shanghai Red Cross, 117; Nanking, 80. *Average for 5-year period*: I. *All attempts*, 74.76; *successes*, 23.3; recoveries (failures), 49.5 - per 100,000 of annual Customs Population Estimates *less* 10% for *children under 10 and reported foreigners. Exciting causes*: Problems of home, 30.5%; outside society, 30.2%; economic depression and unemployment, 22.%; personality conflicts, 4.5%; sickness, 1.76 %; "unknown" and miscellaneous, 11%. (versus Seattle 53.4%, sickness, affectional, 18.6, economic, 14.7, deliquency 6.6). *Methods used*: poisoning, 77%; drowning, 8.7; hanging, 14; "swallowing gold", etc., 5; cutting, piercing, 2.4 - *versus* American: shooting, 26.7; asphyxiation, 23.5; poisoning, 18.5; hanging, 15. Chinese press reports *hanging* highest, 1934. Peking (P.U.M.C.) Hospital: 149 cases, all poisoned; Red Cross, 117 cases, 116 poisoned; Nanking, 80 cases (40% poisoning, 26% hanging). *Occupations*: Without, 32%; "unknown" 46.; workers, 6.7; business, 6.1. *Death ratios*: Women, 55%, men, 45% - almost reversing Seattle ones (36.8 to 46.9). *Recoveries*: excessive, 49.5% of all attempts, challenging "sincere" suicidal intentions. Perhaps due to women's protective threat against inferior position, personality and family frustrations. Age decade 20-29, highest death incidence; 30-39 decade, next; both as in Peking (1917). Shanghai group's ages, marital status data incomplete. Americen frequencies increase to 60 years. *Male to Female Ratio*: 0.876, nearest India's Bombay, 0.92; Punjab, 0.79; next Japan's 1.65-Western: England & Wales, 2.98; Switzerland, 5.22; U.S.A., 2.59.

2. The Effect of Thyroxin on Conditioning and Extinction.

Henry Ellis and Eugene Kanter; *College of William and Mary.*

The experiment was performed to determine the effects of thyroxin on the extinction of a bar-pressing response in white rats under water drive.

18 male rats were matched into 3 groups, 2 experimental and 1 control, on the basis of conditioned rate of responding. Experimental Group 1 received .015 mg. and Experimental Group 2 received .075 mg. of thyroxin injected subcutaneously daily for 4 consecutive days, while the control group received no injections of any kind.

Using the criterion for extinction as 20 minutes of no response, results show no statistically significant difference between the groups for

either mean time or mean number of responses to extinction. However there was a tendency for thyroxin to increase mean time to extinction and decrease mean number of responses to extinction.

The thyroxin did, however, produce a statistically significant depression in the rate of responding and the amount of depression was effectively the same for both experimental groups.

3. Test-versus Item-reliability with Learning Factor Minimized.

Harold D. Good and Burton R. Wolin; *College of William and Mary.*

The multiple choice vocabulary section of the California Test of Mental Maturity was presented four successive times immediately upon completion of the previous administration, to a randomly selected group of freshman college students. The test items were ranked by difficulty, on the basis of the number right on the first two testings of the group. The data were plotted showing inconsistency of response on the four testings as a function of the decile levels of difficulty. Inconsistency of response for the group was greatest for items of intermediate difficulty, and this inconsistency of response approximates a normal curve. This investigation gives evidence that despite increasing reliability from test to test, the average score stayed the same, and that items of intermediate difficulty are mainly responsible for most of the lack of complete reliability from one administration to the next. The basic assumption that tests can be compared to psycho-physical functions is supported.

4. Changes in "Social Maturity" from Freshman to Senior Year in College.

Kathryn Hill and Elise Gamble; *Hollins College.* (Presented by title.)

5. Group Rorschach Scores and Scholastic Averages.

Marjorie Brownell; *Randolph- Macon Women's College.* (Presented by title.)

6. Student's Aid in Planning Professional Courses.

A. W. Hurd; *Medical College of Virginia.*

At the Medical College of Virginia, first and second year students have been asked to give their confidential opinions on various phases of the professional program of instruction. We have tabulated their replies referring to (1) reasons for choosing medicine as a career; (2) dislikes in their premedical college work; (3) the most pressing social problems of today; (4) their most disturbing personal problems; (5) suggestions on desirable features of instruction in the medical school; (6) interests in future medical practice; and (7) satisfying and unsatisfying aspects of freshman and sophomore instruction.

Standing out among hundreds of statements collected were: dissatisfaction with too many lectures; too much detail; too much mere memorization; too little emphasis upon generalizations; too many acute financial problems; too much difficulty in gaining admission to medical school; too much impersonal instruction; too little attention to problem solution and individual project work; too much specialization; too little attention to total health situations; too many short courses; and too infrequent tests and grades to let them know how they were progressing.

Satisfying aspects mentioned most often were: some very helpful instructors; practical courses with ward visits; personalized instruction in some courses; some opportunities to show their abilities in planning; and instruction giving large overviews of the doctor's work.

7. The Ethical Discrimination of Various Groups of College Women, Based on Hollingworth's Scale.

Helen K. Mull; *Sweet Briar College.* (Presented by title.)

8. Further Evidence for Secondary Reinforcement in Specific Hunger Behavior.

John K. Bare; *College of William and Mary.*

The evidence presented showed that under conditions of food deprivation, the preference demonstrated by white rats for saccharine solution over water could be at least partially extinguished, while that for a sucrose solution over water increased. The data were interpreted as supporting an account of the behavior based upon secondary reinforcement. It was reasoned that the absence of food eliminated the primary reinforcement of hunger reduction necessary to provide the saccharine taste with secondarily reinforcing properties.

9. Differential Food Preference as a Function of Secondary Reinforcement.

Paul Spector; *University of Virginia.* (Presented by title.)

10. Simultaneous Galvanic and Faradic Stimulation of the Skin.

Jack A. Vernon; *University of Virginia.*

The literature concerning the electrical properties of the skin reveals that Gildermeister, in 1920, found that the A.C. resistance of the skin was unaffected by the passage of direct current. However, Einthoven and Bijtel in 1923, using a low frequency found that the passage of a direct current significantly lowered the A.C. resistance of the skin.

These data suggest that the thresholds to alternating current should be lowered by the simultaneous presence of direct current. The procedure was to apply varying amounts of direct current, from 0.1 through 0.6 milliamperes, to the first joint of the third finger. Simultaneously the thresholds were determined for alternating currents of 200, 400, 800, 1200, and 1500 cycles per second. In that the D.C. intensities employed were all of subthreshold value the subject had no way of knowing whether he was being stimulated by A.C. and D.C. or by A.C. alone since both modes of stimulation were used in a random fashion.

The findings were: as the intensity of the subthreshold D.C. is increased the cutaneous sensitivity for A.C. at frequencies of 200 and 400 cycles per second is progressively increased. The effect of the D.C. on the higher frequencies was not consistent. Small amounts of D.C. tended to elevate the A.C. threshold to frequencies of 800, 1200, and 1500 cycles per second. And the greatest amount of D.C. used, 0.6 milliampere, tended to decrease the A.C. threshold for these same frequencies. The full implication of these data is not yet obvious. It is hoped that they will be better understood in light of other research now in progress.

11. The Frequency Response Characteristics of the Skin as a Medium for Vibratory Forces.

Carl E. Scherrick; *University of Virginia.*

It is noted that while several investigations of the absolute threshold to vibration have obtained similar functions in plots of frequency *vs.* contactor amplitude, few investigators have attempted to determine the mechanical changes taking place in the skin. Application of static principles directly to vibratory phenomena is not valid, although work in cutaneous sensitivity may assist in determining important physical variables.

Three problems are discussed: (a) The degree to which the skin follows the vibratory motion of the contactor; (b) The differential effects of stimulation perpendicular to or laterally across the skin; (c) The physical characteristics of the skin and underlying tissue which affect the threshold function for vibratory motion.

It is found that the skin duplicates the vibratory motion of the contactor with respect to wave form, that perpendicular stimulation and lateral stimulation appear to differ neither with respect to the motion which they impart to the skin, nor by their effect on the threshold function. From data reported by Geldard and by Bekesy it is postulated that stimulation of broad areas of skin set in motion large masses of tissue, the extent of disturbance of which depends on frequency of vibration. The greater the extent of disturbance, the lower the threshold at any point stimulated, and hence the form of the threshold curve ordinarily obtained—a U-shaped function with its minimum at 250 cycles per second—would be expected. Further research on this problem is being carried out at present.

12. A Comparison of the Effects of Peripheral Light Variation on Tachistoscopic Presentation of Digits.

Andrew W. Gottschall, Jr.; *Washington and Lee University.*

This experiment was performed in an attempt to determine the effects of training with a tachistoscope in a darkened room and in an ordinarily lighted room. This training was also investigated in respect to its transfer to an actual reading situation.

In addition to the two experimental groups and control group, another type of control group was used in an effort to check possible differences in motivational factors.

It was found that the group which operated under darkened conditions progressed more rapidly with actual tachistoscopic procedure which was probably due to the utilization of afterimagery. However, the greatest transfer to an actual reading situation was achieved by the group worked under lighted conditions.

The motivation control group also showed significant gains in reading speed but these gains were not as significant as those achieved by the "Light" group.

13. Conditioning of a Verbal Guessing Response with Subjects Unable to Verbalize the Solution.

Burton R. Wolin; *College of William and Mary.*

80 sophomores at the College of William and Mary independently guessed whether a light would or would not come on three seconds after an auditory signal. The occurrence or non-occurrence of the light

was arranged in sequences of 2, 3, or 4 for a run, thus making the second trial in any sequence "predictable".

Conditioned guessing was obtained. Effectively one hundred percent of the group correctly predicted the second trial of sequences toward the end of the total series of trials. Prediction on other trials was at chance. Students t was 4.67, p was .001.

The subjects could not verbalize the basis for their predictions, and could not report that conditioning had occurred.

BUSINESS MEETING

The business meeting was opened by the President, John Buck at 1:45 p.m.

1. Secretary's report gave the following account of the membership:

Membership a year ago	82		
Present membership	84		
Fully paid members	68		
Unpaid members	16	TOTAL MEMBERSHIP	
Resignations	3	Members	84
Dropped for non-payment of dues	6	Stud. Affil.	9
New members since last May	11		
Student affiliate membership	9		93
Student affiliate paid	5		
Student affiliate unpaid	4		

The secretary stated that the discrepancy between the fully paid membership and the total membership was due to the fact that our constitution does not permit a member to be dropped from the records until two successive years of non-payment of dues.

2. Treasurer's report was as follows:

Receipts		
1. Money on hand, May 1950	$000.00	
2. Dues received May, 1950-May, 1951	249.50	$249.50
Expenditures		
3. Money paid out:		
To Virginia Academy of Science	182.00	
To Conference of State Psychological Association	36.50	
To American Psychological Association for State Affiliates dues	28.00	
	$246.50	246.50
Dues paid in advance for year 1951-52	3.00	3.00
		$249.50
4. Balance now in treasury	3.00	

3. Report of the Committee to Coordinate Research Activities in the Colleges and Universities by Dr. Cecile Finley, Chairman:

Dr. Finley summarized the work of the committee by saying that it had stimulated the initiation of three cooperative research projects in the past year, two of which were never completed. The third was the basis for one of the research papers presented at the current meeting, namely, Changes in "Social Maturity" from Freshman to Senior Year in College" by Kathryn Hill and Elise Gamble of Hollins College. Dr. Finley reviewed the committee's aims which are:

a. To stimulate undergraduate student research.

b. To help students contribute more to the annual meeting by cooperative research efforts with students in colleges other than their own.

The report of the committee was accepted.

4. Report of the Committee on Long-Range Planning, Dr. William Hinton, Chairman.

Dr. Hinton made a few informal remarks summarizing some of the long-range problems which have been discussed by the committee. The two most important topics were the question of how long the annual meeting should last, that is, whether it should be extended to more than one day, and the question of a possible change in the name of the association. The committee concluded tentatively that no lengthening of the annual meeting was at present required although they had discussed the possibility of extending the program through Saturday morning provided a symposium or an invited speaker were to be added to the program. The committee wholly approved the inclusion in the program of a large number of student research reports. As to the name of the association, the question is whether to change the name to the Virginia Psychological Association in conformity with similar organizations in other states. The committee is not at the present time ready to submit any specific proposals on any of these matters.

In the discussion of this report from the floor, Dr. Reuben Horlick asked to have a show of hands regarding the two day meeting plan. Of approximately 40 members present, 12 raised hands in favor of "an extended meeting of more than one day". Since this was not put in the form of a motion, no action followed and the report of the committee was accepted.

5. Report of the Section's Representative to the Conference of State Psychological Associations by Dr. William Hinton.

Dr. Hinton summarized briefly the discussion that took place at the last meeting of the Conference held September, 1950. A completed report on this Conference had already been mimeographed and sent to the members.

6. The Report of the Nominating Committee consisting of Mrs. Harriet MacConnel, John A. Blake, and Cora L. Friedline, Chairman. The Committee nominated the following for officers for the year 1951-52:

Chairman—Dr. A. W. Hurd, Medical College of Virginia
Secretary-Treasurer—Dr. Stanley B. Williams,
College of William and Mary
Executive Committeeman—Dr. Frank W. Finger,
University of Virginia
Representative to the Conference
of State Psychological Associations—Mr. Austin Grigg,
University of Richmond

These nominations were accepted without dissent, a hand vote showing 25 in favor and none opposed. The chairman declared the committee's slate elected.

7. The Report of the Legislative Committee by Chairman, John Buck.

Mr. Buck referred first to the passage by the state of Georgia of the country's first law for the licensing of psychologists. Mr. Buck then referred briefly to the efforts in New York state to develop a law for the licensing of psychologists. A proposed law which had apparently been well prepared and approved by the professional psychologists in New York was passed by both houses of the New York legislature, but was vetoed by Governor Dewey. Mr. Buck wrote to Governor Dewey asking his reasons for the veto. His reply, made by an assistant to the Governor, was brief and non-committal but included a memorandum prepared by the Governor at the time of his veto which gave his justification. Informal comments of listeners seemed to express surprise at the wholly inappropriate and inadequate reasons given by Governor Dewey.

Mr. Buck then reviewed briefly the current status of the proposed Virginia licensing law which has been under discussion in this state for about two years. The committee recommendation is that the present draft of the proposed law be disapproved by the section so that an improved version can be worked out in the future. Dr. Reuben Horlick then moved that "the licensing bill in its present form is not acceptable to the Psychology Section of the Virginia Academy of Science and that the legislative committee of the Section be instructed to maintain a close relation with the corresponding committees of the State Neuropsychiatric Society and the State Medical Association with the view of coming to a mutually satisfactory agreement on licensing legislature as soon as possible." This motion was seconded by Dr. Orr. In the discussion of the motion Dr. Rich called attention to the fact that we do now have for the first time in the state one practicing psychologist but we have no law to protect him. He further stated that he as a member of the Neuropsychiatric Society had attended its recent meeting and there heard considerable discussion about the entrance of a practicing psychologist into the state. He furthermore quoted Dr. Barrett, the State Commissioner of Mental Hygiene, to the effect that there would be no problem as to the status of practicing psychologists if the state legislature had

already passed a proper licensing act. Dr. Horlick then rose to identify himself as the practicing psychologist in this discussion and to report his experiences since the establishment of his private office in Washington approximately two months ago. He stated that he had always tried to make sure that he had the approval of the local medical societies and that he had had such approval before opening his office. He stated further that he was completely devoted to the principle of maintaining harmony with the medical profession. Further discussion from the floor, particularly by Mrs. Miriam Speck, pointed out the fact that psychologists already hired by state or other agencies very often handled private cases in addition to their regular work and had been doing so for many years without any objection ever having been raised by the medical or other professions.

8. Dr. Horlick moved that the Psychology Section go on record as favoring the formation of a northern division of the Section for those living near Washington, D. C. provided that such persons desire it. This motion was seconded and approved without dissent by voice vote.

Business meeting adjourned at 2:30 p.m.

14. The Effect of Order of Presentation upon "Estimates of Mildness" in Certain Cigarette Tests.

William M. Hinton; *Washington and Lee University.*

Purpose: To check the effect of the order of presentation upon results obtained in the Phillip Morris "We dare them all" test.

Subjects: 102 male college students.

Apparatus: Phillip Morris, Camel, Lucky Strike, and Chesterfield cigarettes.

Method: The subject was presented with an unnamed cigarette and requested to follow the procedure outlined in the Phillip Morris instructions. He was then given a second unidentified cigarette and asked to repeat the procedure and then to estimate which one gave him the most definite nasal sensation. 51 subjects were tried with the Philip Morris presented first and the other 3 brands second. Each subject compared only 2 cigarettes - the Philip Morris and another pre-determined by the experimenter. The same number of subjects compared these combinations in reverse order making a total of 102 comparisons.
Results: Where Philip Morris was always presented first it was reported "milder" 74% of the time. When the order was reversed, that is, with Philip Morris always the second cigarette presented, it was reported "milder" 44% of the time.

These data would seem to indicate that the order of presentation of stimuli of this type is an important variable in accounting for the reactions of a given individual.

15. The Interdependence of Psychophysical Judgments of Auditory Differential Intensities.

Williard F. Day; *University of Virginia.* (Presented by title.)

16. Preliminary Investigation of the Conditions Determining the Efficiency of Multiple Task Performance.

    Alec J. Slivinske; *University of Virginia.* (Presented by title.)

17. Equivalence of Response Criteria for the Evaluation of Communication Systems.

    Howard Reuben; *University of Virginia.* (Presented by title.)

18. Transfer of Response of Discriminating as Measured by Habit Reversal.

    William H. Morse; *University of Virginia.* (Presented by title.)

19. Stereotyping of Negroes and Whites: an Analysis of Magazine Pictures.

    Nancy King and Barbara Griffith; *Randolph-Macon Woman's College.* (Presented by title.)

20. New Perspective on Diagnosis.

    Arthur J. Bachrach; *University of Virginia.* (Presented by title.)

21. The Case of the Obliging Diagnosis.

    John T. Payne; *Morganton State Hospital,* North Carolina. (Presented by title.)

Minutes of the Section of Science Teachers [11]

W. I. NICKELS, JR., *Chairman*
SUSIE V. FLOYD, *Chairman-Elect*
MARTHA W. DUKE, *Secretary*
L. W. JARMAN, *Section Editor* (1954)

FRIDAY, MAY 11, 1951 — 9:30 A. M. — ROOM 13, MAIN BUILDING

ANNOUNCEMENTS

Due to the unavoidable absence of the chairman, W. I. Nickels, Jr., John E. Reitz of Lane High School asked the chairman-elect, Miss Susie V. Floyd, to preside at the morning session. It was voted unanimously that our section in 1952 be held from 9 a.m. to 12 noon so that members could attend the afternoon lectures in their chosen field of work. The following papers were presented:

1. The Place of Geology in the High School.

R. S. Edmundson; *University of Virginia* and John D. Tomlinson; *Lane High School, Charlottesville.*

General Geology may be introduced from the historical point of view by noting a few of the great students of earth science and their important contributions. As interest in the science grows the student should realize that modern geology has as its aim the interpretation of the history of the earth, the compilation of data and the discovery of new rock and mineral resources, and the application of certain geologic principles to engineering projects. Such a program makes it necessary to take the major science, geology, and divide it into a number of branches. Closely related to geology are the other natural sciences of astronomy, biology, chemistry, and physics.

A few concepts which a student should develop as a result of an introductory course in earth science include the importance of geologic change and time, conservation of natural resources, and the role of natural laws. These concepts present certain questions which cannot be answered at the present time, but should direct the student's attention to the vast field awaiting further investigation.

Field trips planned for the purpose of collecting rocks, minerals, and fossils probably would be the highlight of any introductory course in geology. This laboratory work would arouse a competitative spirit to excel, not only in the number of specimens, but also in the quality of the material. Outdoor work should also impress upon the student that the varied land forms or scenery are not catastrophic but, with few exceptions, a slow process of sculpturing by some natural agency as wind and water.

It is somewhat premature to say that geology is going to be a dynamic course for the secondary school, for only time and experience can bring this about, but we do feel that it can play an important part in the curriculum of many schools. One advantage of geology is that it requires only a small investment for materials and equipment. As

a result, it may find an important place in small schools where chemistry and physics are not taught, offering the same opportunities for teaching scientific thinking, with a minimum capital outlay.

Basically our work for the year has been devoted to studying the major topics of the text and working the laboratory units that correspond to these topics: "Rocks and Minerals", "Erosion", "Plains", "Plateaus", "Volcanoes", "Weathering", "Glaciers", "Theories of the Origin of the Earth", "Maps", and "The Earth in Space". In only rare cases has our work overlapped in any way with the other sciences and only once have we eliminated materials because they were covered by General Science.

Geology is not only a neglected science in high school, but also a science of our environment that is not being given adequate recognition in any of our science courses.

2. The Study of Surface Chemistry with the Aid of Large Metal Crystals.

Allan T. Gwathmey; *University of Virginia.*

Tribute was paid to the late John Peyton McGuire of Richmond for his inspiring work as a teacher in furthering the scientific interests of young students.

At the University of Virginia a method of study has been developed which consists in growing or preparing individual large metal crystals, so large that you can identify the crystal faces just as you can see the faces on a large diamond.

It has been demonstrated that the properties vary tremendously with the crystal face exposed at the surface. About twelve processes have been studied on a dozen metals.

FRIDAY, MAY 11, 1951 — 2 P. M., ROOM 13 — MAIN BUILDING

3. The Electron Theory in Balancing Chemical Equations.

Mary E. Kapp and Esther Shreve Ruffin; *Richmond Professional Institute* and *St. Catherine's School, Richmond.*

The high school chemistry student often has difficulty in understanding the mechanism of oxidation-reduction in balancing chemical equations. If the structure of the atom is explained emphasizing the role of the electrons in the outer orbit, the concept becomes obvious in light of certain definitions. Simple redox equations are more easily balanced by inspection, but complicated types become fun if certain mechanical rules are followed: (1) the sum of the oxidation numbers (valence) of all atoms in the formula is zero; (2) the oxidation number of any element in the free state is zero; (3) the oxidation number of an ion is the same as its charge; (4) gain and loss of electrons must be equivalent. Oxidation-reduction as an entity naturally accompanies the study of the halogens, but continuity follows throughout the remainder of the course. High school students should have a knowledge of the concept as preparation for comprehensives and college board examinations.

Minutes of the Section of Statistics [12]

CHARLES M. MOTTLEY, *Chairman*
L. WEISS, *Vice-Chairman*
M. E. TERRY, *Secretary*
WALTER A. HENDRICKS, *Section Editor* (1954)

FRIDAY, MAY 11, 1951 — 9:30 A. M. — ROOM 22, MAIN BUILDING

1. A Latin Square Grazing Plan for Dairy Cattle.

N. R. Thompson and M. E. Terry; *Virginia Agricultural Experiment Station, Blacksburg.*

Three pasture mixtures, Ladino clover-orchard grass, alfalfa-orchard grass, and Ladino clover-Kentucky 31 fescue, were grown in each of 4 blocks. Each block contained one replicate of each mixture, randomly located within the block. Three groups of milking cows were used, these being alloted randomly to groups from trios of cows of similar age, size, stage of lactation, etc. Each group grazed all four replicates of one mixture, then was shifted to another, then to the third. Thus at the end of 12 grazing periods each group had grazed each replicate of each mixture.

This plan allows certain sources of variation to be separated from the random error. These sources include group differences among grazing animals, soil gradients and other sources of variation between replicates, and seasonal trends. The reduction in size of error term, in turn, improves the testing of treatment effects for significance of differences.

2. Some Sequential Fish Tagging Models.

E. L. Cox; *Institute of Statistics, Raleigh, N. C.*

An estimate of the number of individuals in a biological population is frequently desired by the research worker. A number of designs for tagging experiments have been considered for this purpose. Frequently the only program that is feasible is to start with an untouched population and replace each sample after marking. The order and frequency of recurrence of tagged individuals in later samples gives some information on the original magnitude of the population.

Some theory of stochastic processes has been applied to this problem and the nature of the probability models worked out. Certain point and interval estimates have been made for specific problems, principally those dealing with fish and mice populations. The advantage over the assumption of Poisson distribution is doubtful for the large population-small sample case.

3. Inadvertent Mixing of Samples.

L. Weiss; *University of Virginia.*

Suppose two samples are independently drawn from two different infinite populations: one sample N_1 from a population with probability density function $f(x)$, the other sample of size $N-N_1$ from a population

with density function $g(x)$. Then all N observations are thrown into a random order so that we no longer know which observations came from which population. The joint distribution of the randomly ordered elements $x_1, x_2, \ldots, x_N$ is the sum of $\binom{N}{N_1}$ terms of the type

$$f(x_1) \cdot f(x_2) \cdots f(x_{N_1}) \cdot g(x_{N_1+1}) \cdots g(x_N) \qquad \binom{N}{N_1}$$

and $x_1, x_2, \ldots, x_N$ are not independently distributed in general. We might have various combinations of information: a knowledge of N_1 and $f(x)$ but not $g(x)$, or of $f(x)$ and $g(x)$ and not N_1, etc. To take two particular cases, if it is known that $g(x)$ $f(x-\delta)$ and δ and N_1 are known, then an estimate of $\int_{-\infty}^{t} f(x)dx$ for any t is given. If $f(x)$ and N are known, a confidence band for $\int_{-\infty}^{t} g(x)dx$ is given.

4. An Application of the Percent Effect Curve to the Sub-acute Toxicity Studies of Hydrazine on Rats (Presented by title.)

I. A. DeArmon; *Army Chemical Center, Maryland.*

5. An Experiment in Grouping Data.

Alonzo M. Myster; *Virginia State College.*

This paper presents some results of an experiment in which data were grouped or rounded. They seem to indicate that certain rules-of-the-thumb found in textbooks are not applicable in a large percentage of the cases in dealing with data representing performances on certain educational tests.

Evidence that the errors in the mean resulting from grouping are not too serious even when the number of intervals is small, when compared with the sampling error of the mean and viewed in light of the accuracy with which these variates may be measured.

The mid-point assumption was investigated, and wide variations in the closeness of agreement between the average of values within an interval and its class mark were found from one position to another.

Empirical evidence suggest the possibility of deriving objective criteria to be used as a guide in realizing more fully the ideal conditions which rules generally presented in elementary texts of statistical methods are designed to achieve.

6. Quality Control in the Wood Industry.

Raymond C. Rhodes; *Virginia Polytechnic Institute.*

Investigations were conducted of the statistical aspects of basic research, engineering development, and economic problems pertinent to The Lane Company, Altavista, Virginia, cedar chest manufacturer.

Estimations were made of the quality level and variability of various manufacturing operations, e.g., the veneer slicer, gang saws, hot plate press, planers, sanders, top panel inspection, and finish inspection. Sta-

tistical quality control procedures were established at points in the processes most feasible for and responsive to their application.

7. Sequential Methods in Subjective Tests.

G. Lombardi; *Virginia Polytechnic Institute.*

The methods of sequential analysis were applied to the selection of judges to be used in taste-testing experiments, by adapting Wald's sequential sampling plan for the binomial distribution. A sequential plan for testing the mean of the binomial distribution was also derived, based on the method of Roa for the sequential testing of the mean of the normal distribution given in Sankaya (1950).

8. Latinized Rectangular Lattice Designs.

B. Harshbarger; *Virginia Polytechnic Institute.*

The Near Balance Rectangular Lattice for $k(k-1)$ varieties is extended to incorporate an additional classification making three in all. This is accomplished by systematically selecting k sets of k incomplete blocks, each of which comes from separate replications in such a way that any one set includes all the varieties. The design has been developed both with and without recovery of inter-block information. Standard errors for the variables and adjustment for the varieties are given.

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares
Columns (replications)	$k-1$	$\frac{\Sigma R^2}{k(k-1)} - \frac{G^2}{k^2(k-1)}$
Rows	$k-1$	$\frac{\Sigma(B_{11}+B_{21}+\cdots B_{h1})^2}{k(k-1)} - \frac{G^2}{k^2(k-1)}$
Interaction Rows and Columns	$(k-1)^2$	$\frac{1}{k^2(k-2)}\Sigma\Sigma(kB_{h1}-T_{h1})^2 - k\Sigma(B_{11}+B_{21}+\cdots+B_{h1})^2 - k(R_1^2+R_2^2+\cdots+R_k^2) + 2G^2$
Varieties (unadjusted)	$k(k-1)-1$	$\frac{\Sigma V^2}{ade\ldots} - \frac{G^2}{k^2(k-1)}$
Error (intra-block)	$(k-1)(k^2-2k-1)$	by subtraction
Total	$k^2(k-1)-1$	$Sy^2 - \frac{G^2}{k^2(k-1)}$

9. **A Significance Test for Differences among Ranked Treatments in an Analysis of Variance.**

D. B. Duncan, *Virginia Polytechnic Institute.*

Given a set of n treatment means, $x_1, \ldots, x_n$, it is often desired to decide whether each of the differences $x_j - x_i$ is significant, that is, whether each of the hypotheses H: $\mu_j > \mu_i$, i, j = 1, 2, ... , n, i = j, can be accepted. A test is obtained for this purpose under the conditions which usually apply or are taken to apply in many analyses of variance, namely that $x_1, \ldots, x_n$ is a random sample from n normal populations with means $\mu_1, \ldots, \mu_n$ respectively, and a common unknown variance σ^2, for which the usual form of independent estimate, s^2 based on n_2 degrees of freedom, is available. This is termed the Multiple Comparison Test.

A complete Wald multiple decision function analysis of the test forms a separate topic in itself and is presented in a common paper entitled "On the Properties of the Multiple Comparison Test." It is shown that under general circumstances the test has an average weighted risk very close to a minimum. A shorter parallel discussion which is less mathematical and relies more on intuition is presented in this paper.

A set of steps with examples is given for applying the test. These consist of a fairly simple sequence of range-like tests followed by variance tests.

10. **Theory of Regression for a Binomially Distributed Variate.**

Glenn W. Suter; *Virginia Polytechnic Institute* and *Crop Reporting Service, Richmond.*

The purpose of the investigation in this paper was to extend the theory of regression to include the case where the dependent variable was binomially distributed.

A necessary set of assumptions for the solution of this problem was stated and the unbiased estimates with minimum variance of the parameters were shown to be

$$b_i = \sum_{\alpha=1}^{n} \sum_{j=1}^{r} w_\alpha c^*_{ij} x_{j\alpha} y_\alpha; \quad i = 1,2, \ldots, r.$$

where c^*_{ij} is an element of a weighted matrix. The distribution of the variable b_i is asymptotically normal with mean

$$\beta_i = \sum_{\alpha=1}^{n} \sum_{j=1}^{r} w_\alpha c^*_{ij} x_{j\alpha} p_\alpha$$

and variance

$$\sigma^2_{bi} = \sum_{\alpha=1}^{n} \left(\sum_{j=1}^{r} w_\alpha c^*_{ij} x_{j\alpha} \right)^2 p_\alpha q_\alpha$$

and the estimate of the variance and covariance are

$$S^2_{bi} = c^*_{ii}, \text{ and } S_{bibj} = \sigma_{bibj} = c^*_{ij}, \text{ respectively.}$$

Tests have been proposed for various hypotheses about the β's corresponding to any specific probability level has been shown.

A numerical example was given to illustrate the theory developed in this paper. It was desired to predict the yield of corn for an individual farm as above or below average on the basis of knowledge of the farmer's individual farming practices.

11. Rank Analysis of Incomplete Block Designs.

R. A. Bradley and M. E. Terry; *Virginia Polytechnic Institute.*

True preference or ratings, $p_1, \ldots, p_t$ are assumed to exist for t treatments in balanced incomplete blocks of two, $\Sigma p_i = 1$. When treatments i and j appear together, the probability that i is "better" than j is taken to be $p_i/(p_i+p_j)$.

The likelihood ratio test criterion is used to test the hypothesis that $p_i = 1/t$ for all i against the alternative (i) that the p's are not all equal and (ii) that two exhaustive groups of treatments have equal ratings but the groups themselves differ. Alternative hypotheses that involve a subset of treatments produce tests dependent on nuisance parameters. The likelihood ratio criterion produces tests which differ considerably from Kendall's coefficient of agreement for paired comparisons. Tables and exact distributions are in preparation. The extension and generalization of the theory to blocks of more than two will be presented subsequently.

12. Systematic Military Programming.

M. A. Geisler; *U.S.A.F., Washington, D. C.*

The Air Force is a very large "business", and it is essential that the different parts of the Air Force be in proper relation to one another. It is also in a constant state of flux and change and it is essential that the resultant changes be reflected rapidly and accurately in all the related Air Force activities.

The purpose of our project, which is known as Project Scoop, is to develop principles, techniques, data and computing equipment which will facilitate the determination of Air Force programs.

An Air Force program is a quantitative statement of the workload, such as the pilot training rate, aviation fuel procurement rate, or engine overhaul rate, to be carried out by the different sectors of the Air Force in order that the overall objectives of the Air Force can be obtained.

The mathematical determinations of Air Force programs have been expressed as the simultaneous solution of large numbers of linear (and occasionally non-linear) dynamic equations.

The emphasis will be on the statistical elements of this project, which is primarily concerned with the development of the coefficients which define the above-described linear equations.

13. Scoring of Bombing Accuracy.

Walter L. Deemer, Jr.; *USAF.*

Most samples of bombing errors, obtained from independently aimed bombs, contain a number of errors which are extremely large, and appear to be caused by some factor in addition to the random errors affecting the other drops.

If it is assumed that the range and deflection components of the random errors have a bivariate normal distribution with expected values at the aiming point, with zero correlation and equal variances, the practical problem of scoring the accuracy consists in estimating the common variance.

A method of estimating this variance is given for the case when the non-random effect is due to the bombardier aiming at some point other than the target.

The method consists of truncating the sample and then estimating the variance from the truncated portion by maximum likelihood.

14. Single Link Designs.

J. Youden; *Bureau of Standards, Washington, D. C.*

Available balanced incomplete block designs require several replications. This is not a serious objection in field trials because the large standard error in such work often makes it desirable to have a fair number of replications. The various lattice arrangements that are available reduce the number of replications at the price of losing symmetry and introducing a considerable complexity in the analysis of the data. Physical and chemical measurements are comparatively high in precision and are commonly made in duplicate or triplicate. A series of designs has been constructed which possesses symmetry, ease of analysis, reasonable block size, and a small number of replications.

15. Ear Corn Damage Project Conducted at Churchland, Virginia.

W. L. James; *Division of Markets, Harrisonburg* and M. E. Terry; *Virginia Polytechnic Institute.*

Until the present time there had been no great need for sampling and inspecting ear corn. But now, with the addition of an ear corn dryer and a change in the marketing methods, it is necessary for corn to be sampled and inspected while still in the ear form.

The procedure that was used to try to find a usable sampling method of ear corn is as follows:

From each lot of corn being sold at a certain storage five different samples were taken. These consisted of (1) a six-ear sample taken at random from the load, (2) a 1-bushel ear sample, (3) a 1-bushel ear sample, (4) a 2-bushel ear sample, and (5) a sample from the entire lot after the load had been shelled. The 1-bushel samples and the 2-bushel sample were taken throughout the load. The ear samples were shelled and then, with the sample taken from the entire shelled lot, were analyzed for the factors affecting the quality or grade. The two 1-bushel samples and the 2-bushel sample were combined, which gave an analysis for a 4-bushel sample. These factors were moisture, test weight and damage, damage being the one in which we are most interested.

The data showed the 4-bushel sample to be closer to the results of the check sample.

List of Members
1951-1952

Note: Following are the types of membership in the Academy:

***Patrons*, who contribute one thousand dollars or more to the Academy.

***Life Members*, who contribute one hundred dollars or more to the Academy.

***Honorary Life Members* (Elected by Council).

**Sustaining Members*, who pay annual dues of ten dollars.

Regular Members, who pay annual dues of three dollars.

Student Members, who pay annual dues of one dollar.
(Restricted to college students only.)

Note: Number following name designates section, or sections, to which member belongs:

1. Agricultural Sciences
2. Astronomy, Mathematics and Physics
3. Bacteriology
4. Biology
5. Chemistry
6. Education
7. Engineering
8. Geology
9. Medical Sciences
10. Psychology
11. Science Teachers
12. Statistics

Please notify Foley F. Smith, P. O. Box 1420, of any errors you may find in this list.

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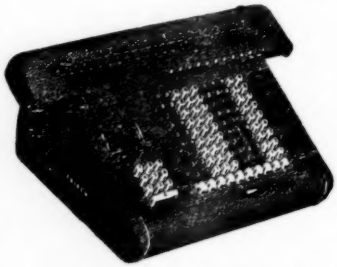

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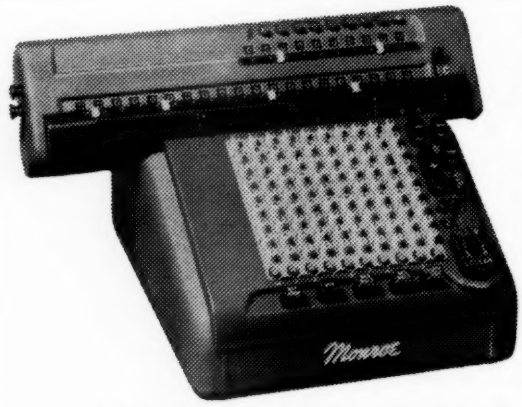

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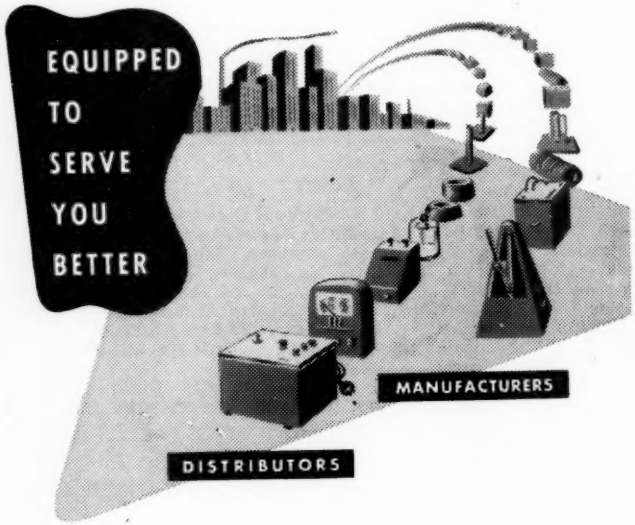

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